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Issued December 10, 1907.

U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF EXPERIMENT STATIONS—BULLETIN 196.

A. C. TRUE, Director.

PROCEEDINGS

OF THE

TWENTY-FIRST ANNUAL CONVENTION

OF THE

ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS,

HELD AT

LANSING, MICH., MAY 28–30, 1907.

Edited by

A. C. TRUE AND W. H. BEAL,

FOR THE OFFICE OF EXPERIMENT STATIONS,

and

H. C. WHITE

FOR THE EXECUTIVE COMMITTEE OF THE ASSOCIATION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1907.

THE OFFICE OF EXPERIMENT STATIONS.

STAFF.

A. C. True, Ph. D.—*Director.*

E. W. Allen, Ph. D.—*Assistant Director and Editor of Experiment Station Record.*

W. H. Beal, B. A., M. E.—*Chief of Editorial Division.*

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Office of Experiment Stations,
Washington, D. C., October 4, 1907.

Sir: I have the honor to transmit herewith for publication Bulletin 196 of this Office, containing the proceedings of the twenty-first annual convention of the Association of American Agricultural Colleges and Experiment Stations, held at Lansing, Mich., May 28–30, 1907.

Respectfully,
A. C. True,
Director.

Hon. James Wilson,
Secretary of Agriculture.

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OFFICERS AND COMMITTEES OF THE ASSOCIATION.

President.

J. L. Snyder, of Michigan.

Vice-Presidents.

E. A. Burnett, of Nebraska; E. A. Bryan, of Washington;
H. H. Harrington, of Texas; C. D. Woods, of Maine;
H. C. Price, of Ohio.

Secretary and Treasurer.

J. L. Hills, of Vermont.

Bibliographer.

A. C. True, of Washington, D. C.

Executive Committee.

H. C. White, of Georgia, *Chair;*
J. L. Snyder, of Michigan; W. H. Jordan, of New York;
W. E. Stone, of Indiana; C. F. Curtiss, of Iowa.

OFFICERS OF SECTIONS.

College Work and Administration.

R. W. Stimson, of Connecticut, *Chair.;* E. R. Nichols, of Kansas, *Secy.*

Programme Committee, The Chairman and Secretary of the Section.

Experiment Station Work.

C. E. Thorne, of Ohio, *Chair.;* P. H. Rolfs, of Florida, *Secy.*

Programme Committee, The Secretary of the Section; C. D. Smith, of Michigan, and E. H. Jenkins, of Connecticut.

STANDING COMMITTEES.

Instruction in Agriculture.

For three years, H. T. French, of Idaho, and H. C. White, of Georgia; for two years, J. F. Duggar, of Alabama, and W. E. Stone, of Indiana; for one year, A. C. True, of Washington, D. C., *Chair.*, and T. F. Hunt, of New York.

GRADUATE STUDY.

For three years, M. H. Buckham, of Vermont, and R. H. Jesse, of Missouri; for two years, W. O. Thompson, of Ohio, and Brown Ayres, of Tennessee; for one year, L. H. Bailey, of New York, *Chair.*, and H. P. Armsby, of Pennsylvania.

EXTENSION WORK.

For three years, W. C. Latta, of Indiana, and C. F. Curtiss, of Iowa; for two years, A. M. Soule, of Georgia, and W. M. Hays, of Washington, D. C.; for one year, K. L. Butterfield, of Massachusetts, *Chair.*, and C. R. Van Hise, of Wisconsin.

EXPERIMENT STATION ORGANIZATION AND POLICY.

For three years, H. J. Wheeler, of Rhode Island, and E. B. Voorhees, of New Jersey; for two years, M. A. Scovell, of Kentucky, and C. E. Thorne, of Ohio; for one year, Eugene Davenport, of Illinois, *Chair.*, and C. D. Woods, of Maine.

LIST OF DELEGATES AND VISITORS IN ATTENDANCE.

Arizona: R. H. Forbes, delegate.
California: A. J. Cook, visitor.
Colorado: L. G. Carpenter and C. P. Gillette, delegates.
Connecticut: R. W. Stimson, L. A. Clinton, and E. H. Jenkins, delegates; Mrs. L. A. Clinton, visitor.
Florida: P. H. Rolfs, delegate.
Georgia: H. C. White, delegate; J. S. Carroll, visitor.
Illinois: E. Davenport and H. W. Mumford, delegates; J. J. Ferguson, H. A. Huston, and F. H. Rankin, visitors.
Indiana: W. E. Stone and A. Goss, delegates; W. C. Latta, J. Troop, C. G. Woodbury, and J. H. Woodbury, visitors.
Iowa: L. H. Pammel and C. F. Curtiss, delegates; P. G. Holden, visitor.
Kansas: E. R. Nichols and A. M. Story, delegates.
Kentucky: J. K. Patterson and M. A. Scovell, delegates; H. Garman, visitor.
Louisiana: W. H. Dalrymple, delegate.
Maine: G. E. Fellows and C. D. Woods, delegates; M. J. Dorsey and W. D. Hurd, visitors.
Maryland: C. P. Close, delegate.
Massachusetts: K. L. Butterfield and W. P. Brooks, delegates; G. S. Ladd, F. W. Rane, Mrs. F. W. Rane, and C. D. Richardson, visitors.
Michigan: J. L. Snyder and C. D. Smith, delegates; C. B. Collingwood, D. Howell, J. W. Hutchins, C. J. Monroe, E. Mumford, A. R. Potts, F. A. Spragg, L. R. Taft, J. D. Tower, and F. D. Wells, visitors.
Minnesota: S. B. Green and H. Snyder, delegates; C. P. Bull and Mrs. H. Snyder, visitors.
Missouri: F. B. Mumford, H. J. Waters, and P. J. Wilkins, delegates.
Nebraska: C. E. Bessey and E. A. Burnett, delegates; H. R. Smith and W. P. Snyder, visitors.
Nevada: H. Thurstell, delegate.
New Hampshire: W. D. Gibbs and E. D. Sanderson, delegates.
New Jersey: J. G. Lipman, delegate.
New York: J. Craig, R. A. Pearson, and W. H. Jordan, delegates; L. H. Bailey, Mrs. L. H. Bailey, F. H. Hall, T. F. Hunt, Mrs. W. H. Jordan, L. B. Judson, M. G. Kains, P. J. Parrott, M. V. Slingerland, F. C. Stewart, and B. von Herff, visitors.
North Dakota: C. B. Waldron and H. L. Bolley, delegates.
Ohio: H. C. Price and C. E. Thorne, delegates; J. C. Barnett, J. Cartwright, Mrs. J. Cartwright, W. J. Green, T. C. Laylin, Mrs. T. C. Laylin, A. D. Selby, and Mrs. C. E. Thorne, visitors.
Oklahoma: W. L. English, delegate.
Oregon: W. J. Kerr, delegate.
Pennsylvania: J. P. Welsh and H. P. Armsby, delegates; H. E. Van Norman and J. H. Washburn, visitors.
Rhode Island: H. Edwards and H. J. Wheeler, delegates.

South Carolina: W. M. Riggs and J. N. Harper, delegates.
South Dakota: R. L. Slagle and J. W. Wilson, delegates.
Tennessee: C. E. Ferris and H. A. Morgan, delegates.
Texas: C. H. Alvord and J. W. Carson, delegates.
Utah: E. D. Ball, delegate.
Vermont: M. H. Buckham and J. L. Hills, delegates.
Virginia: E. A. Bishop, delegate.
Washington: E. A. Bryan, delegate.
Wisconsin: W. A. Henry and H. L. Russell, delegates; W. D. Hoard, visitor.
Wyoming: F. D. Tisdel, delegate.
United States Department of Agriculture: W. M. Hays, Assistant Secretary, delegate; A. C. True, delegate; E. W. Allen, D. J. Crosby, Mrs. D. J. Crosby, and John Hamilton, visitors, Office of Experiment Stations; M. A. Crosby, visitor, Bureau of Plant Industry; H. H. Mowry, visitor, Office of the Assistant Secretary.
Canada: G. C. Creelman, visitor.
Cuba: J. T. Crawley and N. S. Mayo, visitors.
Scotland: R. Wallace, visitor.

CONSTITUTION.

NAME.

This association shall be called the Association of American Agricultural Colleges and Experiment Stations.

OBJECT.

The object of this association shall be the consideration and discussion of all questions pertaining to the successful progress and administration of the colleges and stations included in the association, and to secure to that end mutual cooperation.

MEMBERSHIP.

(1) Every college established under the act of Congress approved July 2, 1862, or receiving the benefits of the act of Congress approved August 30, 1890, and every agricultural experiment station established under State or Congressional authority, the Bureau of Education of the Department of the Interior, the Department of Agriculture, and the Office of Experiment Stations of the last-named Department, shall be eligible to membership in this association.

(2) Any institution a member of the association in full standing may send any number of delegates to the meetings of the association. The same delegate may represent both a college and a station, but shall vote in only one section and shall cast only one vote in general sessions. Other delegates may be designated by any institution to represent it in specified divisions of the sections of the association, but such delegates shall vote only in such divisions, and no institution shall be allowed more than one vote in any sectional meeting.

(3) Delegates from other institutions engaged in educational or experimental work in the interest of agriculture or mechanic arts may, by a majority vote, be admitted to conventions of the association, with all privileges except the right to vote.

(4) In like manner, any person engaged or directly interested in agriculture or mechanic arts who shall attend any convention of this association may be admitted to similar privileges.

SECTIONS.

(1) The association shall be divided into two sections: (*a*) A section on college work and administration, (*b*) a section on experiment station work.

The section on college work and administration shall be composed of the presidents or acting presidents of colleges and universities represented in the association, or other representatives of such institutions duly and specifically accredited to this section, and no action on public and administrative questions shall be final without the assent of this section.

The section on experiment station work shall be composed of the directors or acting directors of experiment stations represented in the association, or of other representatives of such stations duly and specifically accredited to this section.

(2) Members of these two sections (and no others) shall be entitled to vote both in general sessions and in the section to which they respectively belong.

The representative appointed by the United States Bureau of Education shall be assigned to the section on college work and administration; the representative of the Office of Experiment Stations to the section on experiment station work; and the representative of the United States Department of Agriculture to either section as he may elect and the section by vote authorize; but such election once made and authorized may not be changed during the sessions of a given convention.

Each section may create such divisions as it may from time to time find desirable, and shall elect its own chairman and secretary for sectional meetings whose names shall be reported to the association for record.

(3) Each section shall conduct its own proceedings, and shall keep a record of the same, and no action of a section, by resolution or otherwise, shall be valid until the same shall have been ratified by the association in general session, and in the case provided for in the foregoing paragraph (1) shall also have been approved by the section on college work and administration.

MEETINGS.

(1) This association shall hold at least one meeting in every calendar year, to be designated as the annual convention of the association. Special meetings may be held at other times, upon the call of the executive committee, for purposes to be specified in the call.

(2) The annual convention of the association shall comprise general sessions and meetings of the sections, and provision shall be made therefor in the programme. Unless otherwise determined by vote, the association will meet in general session in the forenoons and evenings of the convention and the sections in the afternoons.

OFFICERS.

(1) The general officers of this association, to be chosen annually, shall be a president, five vice-presidents, a bibliographer, and a secretary, who shall also be treasurer; and an executive committee of five members, three of whom shall be chosen by the section on college work and administration and two by the section on experiment station work: *Provided, however,* That a member chosen by either section need not be a member of that section. The executive committee shall choose its own chairman.

(2) Each section shall, by ballot, nominate to the association in general session for its action a chairman and a secretary for such section.

(3) The president, vice-presidents, secretary, and bibliographer of this association shall be elected by ballot upon nomination made upon the floor of the convention and shall hold office from the close of the convention at which they are elected until their successors shall be chosen.

(4) Any person being an accredited delegate to an annual meeting of the association, or an officer of an institution which is a member of the association in full standing at the time of election, shall be eligible to office.

DUTIES OF OFFICERS.

(1) The officers of the association shall perform the duties which usually devolve upon their respective offices.

(2) The president shall deliver an address at the annual convention before the association in general session.

(3) The executive committee shall determine the time and place of the annual conventions and other meetings of the association and shall between such con-

ventions and meetings act for the association in all matters of business. It shall issue its call for the annual conventions of the association not less than sixty days before the date on which they are to be held and for special meetings not less than ten days before such date. It shall be charged with the general arrangements and conduct of all meetings called by it. It shall designate the time and place of the convention. It shall present a well-prepared order of business—of subjects for discussion—and shall provide and arrange for the meetings of the several sections. The subjects provided for consideration by each section at any convention of the association shall concentrate the deliberations of the sections upon not more than two lines of discussion, which lines, as far as possible, shall be related. Not more than one-third of the working time of any annual convention of the association shall be confined to miscellaneous business.

FINANCES.

At every annual convention the association in general session shall provide for obtaining the funds necessary for its legitimate expenses and may, by appropriate action, call for contributions upon the several institutions eligible to membership; and no institution shall be entitled to representation or participation in the benefits of the association unless such institution shall have made the designated contribution for the year previous to that in and for which such question of privilege shall arise, or shall have said payment remitted by the unanimous vote of the executive committee.

AMENDMENTS.

This constitution may be amended at any regular convention of the association by a two-thirds vote of the delegates present, if the number constitute a quorum: *Provided*, That notice of any proposed amendment, together with the full text thereof and the name of the mover, shall have been given at the next preceding annual convention and repeated in the call for the convention. Every such proposition of amendment shall be subject to modification or amendment in the same manner as other propositions, and the final vote on the adoption or rejection shall be taken by yeas and nays of the institutions then and there represented.

RULES OF ORDER.

(1) The executive committee shall be charged with the order of business, subject to special action of the convention, and this committee may report at any time.

(2) All business or topics proposed for discussion and all resolutions submitted for consideration of the convention shall be read and then referred, without debate, to the executive committee, to be assigned positions on the programme.

(3) Speakers invited to open discussion shall be entitled to twenty minutes each.

(4) In general discussions the ten-minute rule shall be enforced.

(5) No speaker shall be recognized a second time on any one subject while any delegate who has not spoken thereon desires to do so.

(6) The hours of meeting and adjournment adopted with the general programme shall be closely observed, unless changed by a two-thirds vote of the delegates present.

(7) The presiding officer shall enforce the parliamentary rules usual in such assemblies and not inconsistent with the foregoing.

(8) Vacancies which may arise in the membership of standing committees by death, resignation, or separation from the association of members, shall be filled by the committees, respectively.

PROCEEDINGS OF THE ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

MINUTES OF THE GENERAL SESSION.

Morning Session, Tuesday, May 28, 1907.

The convention was called to order at 10 o'clock a. m., in the assembly hall of the Masonic Temple, Lansing, Mich., by Vice-President M. A. Scovell, of Kentucky.

The proceedings were opened with prayer by the Rev. Doctor Wilson, of Lansing.

After the call of the roll of delegates to the convention, the report of the executive committee was presented by H. C. White, of Georgia, chairman, as follows:

Report of the Executive Committee.

The executive committee appointed at the twentieth annual convention of the association, held at Baton Rouge, La., November 14–16, 1906, met immediately upon adjournment of the convention and organized by the selection of President H. C. White, of Georgia, as chairman. Five subsequent meetings of the committee were held—at Lansing, Mich., December 31, 1906; at Washington, D. C., January 30, February 25, and April 6; and at Lansing, Mich., May 27, 1907. The proceedings in full of the twentieth convention were edited by the chairman and placed in the hands of the Office of Experiment Stations, United States Department of Agriculture, for publication January 8, 1907. Eight circulars of information were issued and posted to members of the association. The call for the present (twenty-first) annual convention was issued February 5, and the programme for the convention, as prepared by the committee, April 29, 1907.

Although no formal action on the subject had been taken by the association, your committee was aware that there was a general understanding and expectation that the convention of 1907 should be held in some appropriate connection with the celebration of the fiftieth anniversary of the founding of the Michigan Agricultural College, the first established existing institution of the character in America. Numerous communications addressed to the committee confirmed this desire on the part of members of the association. Apprehensive that conditions might not be suitable for the proper transaction of the business of the convention, your committee personally visited Lansing in December and became satisfied that ample accommodations for the convention could be secured at the time of the anniversary celebration and that the exercises in connection therewith need not interfere with the transaction of its business. The call to meet in Lansing at the time of the anniversary celebration was therefore issued.

The association has been made aware, through circulars of the committee, of the passage by the last Congress of an amendment to the agricultural appropriation act, whereby the annual appropriations to the colleges made under the act of 1890 are increased by an annual addition of $5,000 until the total amount received by each State and Territory shall be $50,000. Senator Knute

Nelson, of Minnesota, was the author and the champion of the amendment, and to him, to a large number of Senators and Representatives, to the officials of the United States Department of Agriculture, and to a number of members of the association, in addition to those of your committee, the association is indebted for this timely and gratifying legislation. The provisions of the acts of 1862 and 1890 are not modified by the Nelson amendment, except that authority is specifically given to provide courses for the special preparation of instructors in the elements of agriculture and the mechanic arts. The pedagogic work thus authorized will, no doubt, receive due consideration in the section on college work.

An important matter brought to the attention of the last Congress and acted upon favorably was the designation of the land-grant institutions as depositories of public documents (by act approved March 1, 1907), for which the association through successive executive committees has contended for a number of years.

In the exercise of its authorized discretion your committee deemed it unwise to approach Congress in other matters affecting the interests of the association.

No effort was made by the National Association of State Universities or others interested to further a plan for the establishment of a national university at Washington and your committee did not feel authorized or justified in taking the initiative or in acting alone in the matter. For the information of the association and for possible future service a memorandum is presented with this report of former actions of the association in this matter.

MEMORANDUM OF ACTS OF THE ASSOCIATION IN RELATION TO A NATIONAL UNIVERSITY.

July 14, 1897.—(Eleventh annual convention.) A committee, known as the "Committee on graduate work at Washington," was appointed "to investigate, consider, and, if practicable, devise a plan whereby graduate students of the land-grant and other colleges may have access to and the use of the Congressional Library and the collections of the Smithsonian Institution, the National Museum, and the scientific bureaus of the various departments at Washington of the United States Government, for the purpose of study and research." (Office of Experiment Stations Bulletin 49, p. 39.)

November 16, 1898.—(Twelfth annual convention.) This committee presented a very elaborate report detailing the results of inquiries in Washington, interviews with heads of departments, etc., a list of Government departments and bureaus in which opportunities for graduate work might be offered, and suggested a tentative plan for the creation of an administrative office in the Smithsonian Institution for the direction of such graduate work. On the same day Hon. J. W. Hoyt and Mrs. Calvin S. Brice addressed the convention in the interests of a proposed National University. The committee was continued, with instructions to advocate such legislation by Congress as might be necessary to carry out the purposes of the original resolution. (Office of Experiment Stations Bulletin 65, p. 58.)

July 7, 1899.—(Thirteenth annual convention.) The committee reported that the plan proposed was under consideration of a special committee of the Regents of the Smithsonian Institution, but no conclusion had been reached. It announced that as an initial step in the direction proposed the Secretary of Agriculture had adopted a plan for registering the graduates of the land-grant colleges and admitting them to the service of the Department of Agriculture as "scientific aids," as opportunity offered. (Office of Experiment Stations Bulletin 76, pp. 13–52.)

November 14, 1900.—(Fourteenth annual convention.) The committee reported that the Regents of the Smithsonian Institution were not inclined to undertake the administration of graduate work in Washington as suggested. It reported that, at a joint meeting with a similar committee of the National Educational Association, it had been recommended that the Bureau of Education should be asked to organize the work in the event the Smithsonian Institution should decline. A proposition of the Ohio State University to hold a summer school for graduate instruction in agriculture in the summer of 1902 in cooperation with the association was referred to the executive committee. (Office of Experiment Stations Bulletin 99, pp. 55–58.)

November 13, 1901.—(Fifteenth annual convention.) The committee reported that no further progress had been made in organization of the work at Washington. By resolution the committee was continued and directed "to exhaust every effort to devise a plan whereby graduate study and research in the several departments in Washington of the General Government may be efficiently organized and directed under Government auspices." In the same connection it was unanimously resolved "that the association would welcome with satisfaction the development and organization of a national university devoted exclusively to advanced and graduate research." On the same date arrangements for the summer school for graduate instruction at the Ohio State University in cooperation with the association were adopted. (Office of Experiment Stations Bulletin 115, pp. 54–56.)

October 8, 1902.—(Sixteenth annual convention.) The committee reported limited progress, stating that the situation at Washington had become somewhat complicated by the establishment of the Carnegie Institution and the indefiniteness, for the time being, of the plans of this institution. The committee was continued. The report of the graduate school at the Ohio State University was presented (p. 23). (Office of Experiment Stations Bulletin 123, p. 43.)

November 17, 1903.—(Seventeenth annual convention.) The committee reported no further progress at Washington. The title of the committee was changed to that of committee on "graduate study." Further efforts at Washington were abandoned and the committee took in charge arrangements for summer schools in graduate work at land-grant institutions in cooperation with the association. (Office of Experiment Stations Bulletin 142, pp. 33–37.)

As instructed by the last convention, the chairman of your committee appeared before the board of trustees of the Carnegie Foundation for the Advancement of Teaching, in company with representatives of the National Association of State Universities, in New York City on November 21, and advocated the admission of the land-grant colleges to the benefits of the Foundation. Subsequently a large mass of statistical information concerning the colleges was collected and submitted to the executive committee of the Foundation. The president of the Foundation, Dr. Henry S. Pritchett, and the board of trustees gave courteous and sympathetic consideration to the presentation made by your representative. Bulletin No. 1 of the Carnegie Foundation, issued in March, 1907, presents in very complete and exhaustive manner the present views of the board of trustees and the consequent conclusion in the matter. This is for the present adverse to the admission of the land-grant colleges, but President Pritchett has assured the chairman of your committee that the decision is not final and extends an invitation for further conference in advance of the next annual meeting of the board of trustees in November, 1908. Your committee is of opinion that it would be well for the association to continue its efforts in this direction.

The committee has considered, as instructed, the feasibility of holding occasional meetings of the association in connection with the annual meetings of the National Education Association, with provision of a special programme for discussion of the pedagogics of agriculture and allied subjects, but is not prepared at this time to make a definite recommendation thereon. The committee is of opinion that it will be well to await the results of the efforts now pending under instructions of the association to secure the establishment of a department of rural education in the National Educational Association before considering further this proposal.

The committee has inquired into "the extent to which the stations failed to receive the appropriations for 1905–6 under the Adams Act."

The Office of Experiment Stations reports that four stations failed to use any portion of the first year's appropriation, while eighteen others reported unexpended balances ranging from $2.05 to $3,919.89. Several of the stations which reported large balances explained that at the stage of their investigations and with the short time available all of the fund was used which could be used to advantage under the restrictions implied by the act. A memorandum giving the figures in detail is attached to this report. Relief in these cases can only be had, it appears, by special act of Congress. Your committee is of opinion that it would be unwise and impracticable for the association to undertake to secure this action. The individual stations concerned might endeavor to secure the appropriate legislation if thought desirable and wise in the several cases.

The finances of the association have been economically administered, all obligations met, and a satisfactory balance left in the treasury.

Respectfully submitted for the committee.

H. C. White, *Chairman.*

The report was received and filed.

Report of Treasurer.

J. L. Hills, of Vermont, submitted his report as treasurer, as follows:

Report of treasurer, November 14, 1906, to May 28, 1907.

GENERAL FUNDS.

Receipts:	
To cash on hand at Baton Rouge meeting	$958.38
To dues	1,440.00
Total	2,398.38
Disbursements	1,465.84
Balance in bank May 28, 1907	932.54

Classification of disbursements:	
Executive committee	1,419.10
Special committee	20.35
Secretary-treasurer	26.39
Total	1.465.84

GRADUATE SCHOOL SUBSCRIPTION FUND.

Receipts: 7 subscriptions, at $25 each	175.00
Disbursements: University of Illinois	125.00
Balance in bank May 28, 1907	50.00

The report was referred to an auditing committee, consisting of A. C. True, of Washington, D. C., H. J. Waters, of Missouri, and E. A. Bryan, of Washington, which later reported as follows:

The auditing committee have examined the books and vouchers of the treasurer and found the same to be in good form and correct. We have therefore approved his accounts.

Report of the Bibliographer.

A. C. True, of the Office of Experiment Stations, submitted the following report:

With the expectation that this convention would largely deal with matters of historical interest, your bibliographer has thought best to depart from his usual course and present at this time some rummage notes drawn from more or less ancient archives.

(1) The first Agricultural Reader designed for the use of schools in this country was written by Daniel Adams, M. D., and published at Boston in 1824. In the introduction the author quotes Doctor Apthorp to the effect that "Agriculture and the Gospel are the two great instruments of Divine Providence to check the voluptuousness and exercise the virtues of man." Among other subjects, it contains chapters on lightning rods, brief hints to parents, the way to make money plenty in every man's pocket, the mode of making and refining cider adopted by the religious society called Quakers, and poems on rural felicity and female felicity. In the latter the poet, after telling of the simple work and attire and good reputation of the country woman, concludes as follows:

> "If love's soft passion in her bosom reign,
> And equal passion thrills her happy swain,
> Soon Hymen joins assenting hearts and hands,
> The parson twines and sanctifies the bands.
> At length with joy she sees her little race
> Hang on her bosom and her cottage grace;
> The fleecy ball their busy fingers cull
> And from the spindle draw the length'ning wool;
> Thus flows her hours with constant peace of mind,
> Till age the latest thread of life unwind."

(2) A book which apparently was quite widely used was M. M. Rodger's Scientific Agriculture, or the Elements of Chemistry, Geology, Botany, and Meteorology, Applied to Practical Agriculture (illustrated by numerous engravings and a copious glossary), published at Rochester, N. Y., 1848. More than half this book is devoted to the four sciences. It seems to have met a demand for a comprehensive text-book on science and agriculture, which students could go through in a limited time. The list of authorities cited in this book is interesting. Kane's, Fowne's, Silliman's, and Turner's Chemistry; Liebig's Agricultural Chemistry; Lyell's, Hitchcock's, and Comstock's Geology; Gray's, Wood's, and Eaton's Botany; Muller's Physics and Meteorology; Boussingault's Meteorology; Brande's Encyclopedia; Lardner's Lectures on Science; Encyclopedia Britannica; Johnston's Agricultural Chemistry; Thaer's Principles of Agriculture; Potzholdt's Lectures on Agriculture; Colman's European Agriculture; Gardner's Farmers' Dictionary; Report of Regents of the University of New York; Transactions of the New York State Agricultural Society.

(3) The catalogues of Harvard and Yale for 1857 give interesting data concerning the conditions of instruction in the natural sciences when the Michigan Agricultural College was opened. The faculty of Harvard University consisted of 51 persons and included Louis Agassiz, professor of zoology and geology; Asa Gray, professor of natural history; Josiah P. Cooke, professor of chemistry and mineralogy; Chas. W. Eliot, assistant professor in mathematics and chemistry; E. N. Horsford, professor and lecturer on the application of the sciences to the useful arts; J. Wyman, professor of anatomy; Jos. Lovering, professor of mathematics and natural philosophy, and Benj. Peirce, professor of astronomy and mathematics.

In Harvard College there were 398 undergraduates and 4 graduate students; in the Lawrence Scientific School, 67 students; in the Divinity, Law, and Medical schools, 231 students—a total of 700 students in the university.

In the college chemistry and botany were required in sophomore year, physics in junior and senior years. Botany was an elective in junior year and geology, anatomy, and zoology in senior year.

In the Lawrence Scientific School "candidates for admission must have attained the age of 18 years, have received a good English education, and be qualified to pursue to advantage the courses of study to which they propose to give their attention." "The degree of Bachelor of Science may be conferred on any student who, having attended the instruction of the school for at least one year and completed the prescribed course of study in one or more departments, shall have passed a satisfactory public examination." There were 17 students in chemistry, 6 in geology and zoology, 8 in comparative anatomy and physiology, 1 in botany, and 1 in mineralogy and geology.

In chemistry Professor Horsford gave a course in "experimental chemistry and research," including, among other things, analysis of soils and ashes and manufacture of manures. "In addition to the practical instruction in chemistry as an art, in which each student is necessarily a class by himself, there is a systematic daily exercise, on the blackboard, in the solution and explanation of chemical problems."

In zoology and geology, besides the lectures, Professor Agassiz "will afford students access to his laboratory during certain hours, in order to show them how to observe isolated facts, how to determine living and fossil animals, how to identify rocks of different formations, and how to conduct a regular geological survey." Excursions in term time and vacation are also offered. Professor Agassiz took considerable interest in the Massachusetts Agricultural College and was chairman of the examining committee of its board of observers (the State board of agriculture) for several years in its early history.

In botany Professor Gray will give "special practical instruction" "in classes of not more than 3 each" from April 1 to the close of the term. The botanic garden is accessible to students.

The faculty of Yale College in 1857 consisted of 41 persons, and included Benj. Silliman, emeritus professor of chemistry, mineralogy, and geology; D. Olmsted, professor of nature philosophy and astronomy; C. Hoover, professor of anatomy and physiology; J. D. Dane, professor of natural history; Benj. Silliman, jr., professor of general and applied chemistry; J. A. Porter, professor of organic chemistry; S. W. Johnson, professor of agricultural and analytical chemistry, and E. H. Twining, assistant in analytical chemistry.

In the undergraduate courses there were 447 students; in the Yale Scientific School, 36 students, of whom 13 were in chemistry; in theology, law, and medicine there were 82 students—making a total of 565.

In the undergraduate course there were only six electives, of which mineralogy is one (for a single term—one-third year); natural philosophy and astronomy were required in junior and senior years, one term of chemistry, and short courses of lectures in mineralogy, geology, meteorology, and anatomy.

"The analytical laboratory is fully equipped with means of practical instruction in all branches of analytical and experimental chemistry." "The whole course occupied two years." Previous study of chemistry was not essential to admission to the scientific school.

(4) In 1871 a convention of friends of agricultural education was held in Chicago as the result of a call issued by Dr. J. M. Gregory, regent of the Illinois Industrial University, and others. The proceedings were published in the annual report of the board of trustees of Illinois Industrial University for 1870–71, pages 215–351. It was attended by 29 persons, among whom were Dr. J. M. Gregory, regent of the Illinois Industrial University; Dr. Manly Miles, professor of practical agriculture, Michigan Agricultural College; Dr. Joseph Denison, president Kansas Agricultural College; D. C. Gilman, professor of physical geography and history, Sheffield Scientific School; Prof. A. N. Prentiss, chair of botany and horticulture, Cornell University; E. W. Hilgard, professor of chemistry, University of Mississippi; John Hamilton, professor of agriculture, Pennsylvania Agricultural College; G. C. Swallow, professor of agriculture, University of Missouri; W. W. Daniels, professor of agriculture and analytical chemistry, University of Wisconsin; W. W. Folwell, president University of Minnesota; S. H. Peabody, professor in Massachusetts Agricultural College; A. S. Welch, president of Iowa Agricultural College; I. H. Roberts, farm superintendent of Iowa Agricultural College; and G. E. Morrow, editor Western Farmer.

At this convention Dr. Manly Miles made an address on "What experiments should the agricultural colleges make in common, and what should be the method of conducting them?" This called for a long discussion and the appointment of a committee to bring in "a set of experiments recommended for trial at the agricultural colleges in the various States." This committee outlined the field of experimentation broadly under three heads and made specific plans, with diagrams, for these field experiments: (1) To test variations of soil; (2) the planting of corn in hills and drills; and (3) the uniform application of manures on adjacent plats.

Then followed more description and discussion of the experiments then in progress in Pennsylvania, Wisconsin, and elsewhere, and the following resolutions were adopted:

"*Resolved*, That the very strong commendation that the agricultural experiment stations of Europe have received from such persons as Johnson and Liebig as a source of a large amount of agricultural science and practical progress, as well as our own examinations into the subject, make us believe the establishment of not less than one such station in each of the several States of the Union would be eminently beneficial to the agricultural interests of the country.

"*Resolved*, That a committee consisting of one from each of the several States in which an institution founded on the national grant has been organized be appointed by the President, whose duty it shall be to memorialize Congress and the several State legislatures for the speedy establishment of such stations throughout the country."

This committee was appointed, but apparently did not take effective action. The following letter (July 12, 1906) from Professor Hilgard is of interest in this connection:

"As to that meeting at Chicago in 1871 I have always considered it as the effective beginning of the experiment-station movement. It followed the meeting of the American Association for the Advancement of Science at Indianapolis, from where a number of men, including myself, went to Chicago as the result of a call issued some time before by a committee of agricultural college men, to discuss the question of agricultural education, which at that time already had begun to be sharply contested between the advocates of the 'Michigan plan,' also followed by Pennsylvania, and those who, with the Sheffield School, Harvard, and a few others, favored the university grade of agricultural education. I, after a few years' trial of the Michigan plan at the University of Mississippi (which I then represented), contended strongly for the second, with the corollary that in order to interest the farmers experimental work bearing directly upon each State's practical problems are the prime need. We had quite a lively time, Michigan battling strongly for the student-labor plan as the only 'practical' one, and which would not 'educate the students away from the farm.' Gilman, then librarian of Yale, and I were the chief fighters on the university side, seconded in a measure by Gregory and the delegates from Wisconsin and Minnesota. Finally the committee of which you speak was suggested, to report at a subsequent meeting. That committee met only for a few minutes, Gregory very sensibly stating that the matter was too important and complex to be summarily discussed. Those unable to attend the future meeting were requested to report their views in writing. The experiment station side of the question was strongly emphasized for further elucidation.

"I was one of those who, on account of distance, could not attend that subsequent meeting, if any was held. I was requested by the regents of the University of Mississippi to write for them a report of the Chicago meeting, and I did so, and sent a copy to Doctor Gregory. I may be able to find a spare reprint of that report, if it interests you; I have one copy bound up with my other publications. In this I dealt somewhat elaborately with the matter of experimental work, which I had been doing in Mississippi for a number of years, and found most effective in gaining popular interest and assuring legislative appropriations. But after I left Mississippi the 'Michigan' plan was brought up, and on the usual trite arguments a separate agricultural college was established.

"If Doctor Gregory ever made a formal report as chairman of that committee of 20, I never saw it. I rather think he found such discrepant views in the papers sent that he thought it would do no good to rehash them on the Chicago basis. Soon after came the proposition for the formation of the Association of Agricultural Colleges, which overshadowed for the time the previous action taken.

"When at the University of Michigan in 1873–75, I met several of the Lansing faculty, and among other things told them that their 'oldest agricultural college in the United States' had not yet succeeded in enabling me to get a pound of commercial fertilizer for my lawn within the State, which it seemed to me spoke poorly for the progressive agriculture the college was supposed to stand for. That it looked as though they 'returned their students to the farm' to do as poor farming as their forbears; and that unless they started experimental work they would stay in that groove. Shortly after they did begin experimental work, whether as a result of my insistence or of their own motion, deponent saith not.

"The idea at Chicago was that the States should establish and maintain such stations; we were too democratic then to talk about Congress. Hatch and Adams were not in evidence then, and even Morrill was thought to have set a dangerous precedent. We have changed all that since; but undoubtedly the Chicago meeting of 1871 set the experiment station ball rolling, first of all."

At this convention there was considerable discussion of the system of manual labor then in vogue in the agricultural and mechanical colleges. This led to the following editorial comments by the New York Tribune of September 6, 1871:

"It is therefore at the West that the most remarkable results have thus far been reached. At the East it is believed that students' time is too much crowded for careful attention to agriculture, notwithstanding the success of the Amherst 'Aggies' at the boat race, of which the agricultural professors are very proud, as the winning crew were the best scholars in their class, and were also among the hardest workers of the labor students. But at the West it is found that the students who do the most manual labor invariably accomplish the most study, and the best workmen are the best scholars. This is probably in part because the work at the West is not made compulsory, and the signal success with labor, in Oberlin, Ohio, may have relation to this feature. Where the students are paid extra for their labor, as in Wisconsin, a system of 'docking' the pay where the work was not assiduously performed, had the effect of greatly increasing its efficiency.

"But the indirect effects are as remarkable as those which lie on the surface. The students at Champaign, Ill., 'are not only not ashamed of labor,' says Professor Gregory; they 'love it.' They are brought by it into greater intimacy with their teachers, resulting in a better appreciation of the wants of the student, less trouble as to his discipline, extraordinary efforts on his part, and a personal improvement that is manifest in the high moral character of the graduates. All this has a correlative effect also upon the teachers, who go with the students into the field and the workshop and take hold themselves; an excellent effect, physical as well as moral. Doctor Welch, of Iowa, declares that it benefits him far more than the gymnasium. Professor Miles, of Michigan, tells of the delight which he and his boys experienced on completing a school building, every part of which was the work of their own hands. Doctor Gregory asks how he could help a joyful sympathy when his students, having constructed a 40-horse-power steam engine, asked him to sit down with his back to it and say if he could tell when it was in action and when not, its movements were so noiseless."

(5) Among the men who had the greatest influence in laying the foundations for the present system of agricultural education in Europe, and whose work was also taken as a basis for the establishment of agricultural colleges and schools in the United States, was Dr. Albrecht Daniel Thaer, of Hanover, Germany, who lived from 1752 to 1828. He was educated as a physician at the University of Göttingen, where he established a successful practice of medicine prior to taking his doctor's degree. At about that time a professorship of agriculture was established at that institution. He then returned to Hanover, where he was so successful that he was appointed physician to the Court of Hanover in 1780. He became more and more interested in agriculture, giving much time to its practice and seeking to improve his methods. He soon became famous in this line throughout Europe, and traveled extensively in prosecution of his plans for the improvement of agriculture. About 1800 he established a small agricultural school at his native town, Celle, in Hanover, but in 1803 this was broken up by the invasion of the French. Soon after this, at the urgent solicitation of the King of Prussia, he went to Berlin and founded an agricultural school with a farm of 400 acres at Moeglin, about 20 miles from the Prussian capital. This work was interrupted by war, but was successfully conducted from 1807 to 1826. According to an English traveler who visited it in 1820, it comprised "a model farm of 1,200 acres and a college for instruction. The education was partly theoretical and partly practical description." Chemistry, geology and botany, together with mathematics, were taught and "practical instruction was communicated by an experienced agriculturist." As a result of Thaer's efforts and success, similar schools were established in Germany and other European countries. He was the author of a number of works, the most important of which was his Principles of Rational Agriculture, written in 1810–1812. A translation of this work by William Shaw and Cuthbert W. Johnson was published in London in 1844 and New York in 1846. This was among the volumes placed in the Michigan district school libraries. Thaer was much interested in experimental work as a means of improving agriculture, and his views on agricultural experimentation are very interesting, especially when we consider what time they were published. Attention is therefore called to the following extracts from the book referred to:

"It is only within the last century that the art of making experiments has been clearly apprehended. It is on this art that the principal power of man over the material world is founded; and that power will become more extended in proportion as he brings this art nearer to perfection and carries it into full practice.

"It is not often that, in an isolated situation, under the very hand of the naturalist, or in the laboratory of the chemist, any complete and satisfactory experiments can take place. They are beyond the active sphere of the agriculturist, properly so called. Nevertheless, the manner of recognizing them, of investigating them, and disposing of them is, as we shall see, of the greatest importance in the science of agriculture.

"There is a particular kind of agricultural experiments which have arrived almost at perfection, and which can be regulated with a degree of precision equal to that which is attained in the other practical sciences; these are comparative trials in the open air.

"It is true that experiments of this kind are not easily made; but, nevertheless, they are in the power of every reflecting agriculturist. Whoever has accomplished one experiment, whatever may be the peculiarity of the circumstances under which it was made, and has given a faithful account of it, has well contributed to the advancement of science, and consequently to useful practice, and has entitled himself to the gratitude of his contemporaries and of posterity. It would surpass the power of any single individual to accomplish any considerable number of these experiments, and could not be expected from him. It is the duty of the Government to place some well-educated men in a position to employ their time and talents in investigating the secrets of nature for the advancement of agriculture and the general good.

"Agricultural societies, which are instituted for the advancement of science, should especially engage in the preparation of such experiments, and divide the execution of them among the several members.

"The number of these special experiments being as yet far too small, we are compelled to draw on the large collection of individual observations, imperfect as they are, to adopt them as the principles of our science.

"Science would have made much greater progress if the false shame with which agriculturists conceal every unsuccessful experiment and the exaggerated manner in which they often relate all those in which they have succeeded had not retarded its progress."

Further on he says, in appreciation of the sciences: "Scientific instruction in agriculture should always be based on sound notions of physics and chemistry, and we should endeavor by means of these sciences to penetrate as far as possible into the principles and foundation of things; for *the want of success in our researches and the reason that we do not arrive at more numerous and more sound conclusions is to be attributed to our imperfect knowledge of the phenomena of nature*." He thus makes an appeal at that early date for fundamental investigation into the principles of agriculture by means of the sciences, points out the prime importance of this to progress, and makes this knowledge the necessary basis of instruction in agriculture. "Agriculture ought to borrow from every science the principles which she employs as the foundation of her own."

The report was accepted and ordered printed in full.

W. A. Henry, of Wisconsin, recalled other points of historical interest not included in Doctor True's report and moved that Doctor True enlarge and amplify his notes and secure their proper publication for deposit in agricultural colleges and libraries for future use.

E. Davenport, of Illinois, favored the undertaking of a complete history of the whole agricultural educational movement before the passing away of the men who have been familiar with it from the beginning.

W. H. Jordan, of New York, thought that the motion ought to carry with it the idea that the Office of Experiment Stations should have sufficient funds and assistants with which to carry on so large a work, a view concurred in by J. K. Patterson, of Kentucky, and others.

Assistant Secretary W. M. Hays suggested that Director True assemble this material " in order that history may be written, and written not necessarily too soon after it has occurred, but after sufficient time gives the proper perspective. In other words, that we center in his office the recording of the history of this movement now and in the future."

John Hamilton, of Washington, D. C., called attention to a report presented to the Pennsylvania legislature in 1864 by Dr. Evan Pugh, at that time president of the Agricultural College of Pennsylvania, in which he outlined a remarkably complete faculty of agriculture.

C. E. BESSEY, of Nebraska. Before we leave this subject it should be definitely understood that we expect to have the bibliographer's report printed in essentially its present form soon. We have been piling in so much that it looks as though we should not get a complete history for many years. I think it is really the sentiment of this body that we want this as a sort of prodromus, and then we can have the final history later.

Director Henry's motion was concurred in.

On motion of J. K. Patterson, of Kentucky, a committee, consisting of A. C. True, E. Davenport, and W. A. Henry, was appointed to take charge of the matter of a history of agricultural education.

H. L. Bolley, of North Dakota, spoke in advocacy of practical training in agricultural courses.

Robert Wallace, professsor of agriculture and rural economy, University of Edinburgh, Scotland; J. T. Crawley, director of the Cuban experiment station; N. S. Mayo, vice-director of the Cuban experiment station and chief of the department of animal industry; and Ex-Governor W. D. Hoard, of Wisconsin, were given the privilege of the floor, with all rights except that of voting.

REPORT OF COMMITTEE ON EXTENSION WORK.[a]

The following report of the standing committee on extension work was presented by K. L. Butterfield, of Massachusetts, chairman:

At the last meeting of the association your committee gave the results of a rather superficial but somewhat wide survey of the whole field of extension work as at present carried on in the United States under various auspices.[b] In this report your committee has endeavored to give a more detailed statement in regard to the extension work done by the land-grant colleges. Necessarily the account from each college is very brief.

We have now had a view of the general field and a closer look at the immediate problem as it affects the colleges represented in this association. We are prepared with a point of departure for a more careful discussion of methods of work and forms of organization, and this discussion we hope may be presented in the near future.

As last year, we desire to express our appreciation of the cooperation of the United States Department of Agriculture, and particularly of the efficient and sympathetic services of Prof. John Hamilton, institute specialist in the Department, who has been acting as secretary of the committee, and to whom the burden of preparing this report has very largely fallen.

In December, 1906, a letter was sent out to the presidents of the land-grant colleges calling attention to the recommendations of the standing committee on extension work as presented at the meeting of the Association of American Agricultural Colleges and Experiment Stations at Baton Rouge, requesting that any action taken in the direction of carrying out these recommendations by the institutions addressed be reported to the secretary of this committee. The letter was accompanied by a copy of recommendations, numbers 1 and 2 of which are as follows:

(1) That each college represented in this association organize as soon as practicable a department of extension teaching in agriculture, coordinate with other departments or divisions of the agricultural work, with a competent director in charge, and, if possible, with a small corps of men at his disposal. This department should take on, just so far as possible, all phases of extension teaching now performed in other ways. Your committee hopes at some future time to suggest a scheme of organization and effort which would be applicable to most institutions. At present, however, it merely advises this initial and all-important step, that of having an official whose chief business will be to foster, to systematize, and to organize for the institution all the phases of extension teaching it cares to assume.

(2) If, in case of any agricultural college, this step is at present impracticable, we would recommend most strongly that the college appoint a faculty committee on extension teaching in agriculture. This committee can be of great assistance to your own committee in further investigating conditions and methods of extension teaching in the respective States. Further than that, each one of such committees should make a careful study of the problem in its particular State, with special reference to the possibility of organizing definitely a department of college extension.

Forty-two colleges, representing 39 States, replied giving the extent of work of this character already undertaken, and in some instances presenting also outlines of organization for future effort in this direction.

The following summary of these reports indicates in a general way what each institution is doing along extension lines. The reports, for convenience, are arranged in alphabetical order according to States.

ALABAMA.

Tuskegee Normal and Industrial Institute.—Aside from the regular course in teaching there is the farmers' institute, which meets monthly. There are also branch or local institutes in the more thickly settled communities, to which the industrial institute sends lecturers, and from which delegates are appointed to attend the monthly institute at the college. In addition to this a farmers' short course of two weeks' duration is conducted each year, having had an enrollment in 1906 of 65 and an average attendance of 50.

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[a] See also U. S. Dept. Agr., Office of Experiment Stations Circ. 75.

[b] See U. S. Dept. Agr., Office of Experiment Stations Circ. 72.

An itinerant lecturer has been appointed, whose business it is to visit the rural schools with a view to the improvement of the social condition of communities, of school buildings and surroundings, and of the character of the teaching.

Each year a round-up convention known as the "Tuskegee Negro Conference" is held at the institution. Cooperative work with the National Department of Agriculture in demonstration farms is being undertaken, and a number of farms have been selected for this purpose.

This exterior work will be supplemented this year by what is called the "Jesup wagon," which is, in effect, a traveling school of agriculture, equipped with illustrative material and lecturers, to go out to the plantations, farms, and other points wherever a few people can be gotten together, to hold meetings for the discussion of subjects along all lines of farm activity.

ARIZONA.

University of Arizona.—For the past three years extension teaching in agriculture has been carried on to a limited extent. No separate director or set of instructors for this department has been employed. What has been done has been under the general supervision of the president of the university and the director of the experiment station. Two thousand seven hundred dollars was voted in 1903 by the Territorial assembly to provide for the expenses of farmers' institutes and short-course instruction in agriculture throughout the Territory. Since the spring of 1904, under this authority, the university has held institutes at eight or ten places, employing for instructors the director of the experiment station, the botanist, and the animal husbandman. There is a possibility of enlarging the scope of this work, but the demand at present is comparatively small in this mining country.

ARKANSAS.

Arkansas Agricultural College.—Extension work by this institution has been quite limited in the past, owing to lack of means for the purpose. The recent legislature appropriated $3,000 for farmers' institutes. A committee of the faculty on agricultural extension has been appointed and will formulate plans looking to a more complete system of extension work than the farmers' institutes afford.

COLORADO.

State Agricultural College.—Extension work by the college has been limited to the conducting of farmers' institutes. For this purpose $4,000 a year has been appropriated and the professor of animal husbandry at the college has been placed in charge of the work.

CONNECTICUT.

The Connecticut Agricultural College.—In Connecticut there are four active agencies engaged in extension work in which excellent personal initiative on the part of a considerable number of citizens of the State is being shown. The college authorities feel that where such activity exists every effort should be made by the institution to foster rather than to supplant it. The agencies are the Connecticut State Dairymen's Association, the Connecticut Pomological Society, the Connecticut Poultry Association, and the Connecticut State Board of Agriculture.

The college is aiding these various organizations in an informal way. It is doing extension work without appropriating the name. The president writes: "So far as our institution is concerned, it is not feasible at present, and I doubt if it will be feasible for a number of years to come, for us to establish a department of extension teaching. Activity is the main thing, and if we can continue to enlist an increasing number of citizens in the crusade at the small price of doing without this name the sacrifice, it seems to me, will be well worth while."

FLORIDA.

University of the State of Florida.—The reorganization of the educational system in this State and the lack of funds at the disposal of the university for extension work make it impossible for the institution to undertake any agricultural extension work at present along the lines suggested by the committee.

The State legislature of 1907 has appropriated $10,000 for farmers' institutes for the next two years. This will contribute to the general cause of agricultural education throughout the State.

GEORGIA.

University of Georgia.—No extension work has been undertaken by this institution other than the farmers' institute work inaugurated several years ago. The president of the college of agriculture says: "It is probable that at the annual meeting of our board of trustees in June additional work on the line of extension work will be considered and adopted."

ILLINOIS.

University of Illinois, College of Agriculture.—For a number of years this institution has had college extension work in progress under the management of a superintendent, who has devoted his entire time to the work. At the opening of the present year (1907) there was added to this department an experienced teacher—a graduate of the college—to devote his entire time to the subject of teaching agriculture in the public schools. The dean of the faculty of agriculture writes: "The experience of the year indicates that the place to begin this work in Illinois is in the secondary schools, not in the primary schools, as is often assumed. We are convinced from experience that a large amount of agricultural matter lends itself readily to secondary instruction, and a goodly number of high schools are preparing to add the subject of agriculture to their courses."

INDIANA.

Purdue University.—The university for a number of years has been active along a considerable number of lines of extension work pertaining to agriculture, such as lecturing at farmers' institutes; holding normal institute schools for institute lectures; providing short courses in agriculture; equipping and accompanying railway specials; assisting at teachers' institutes; providing courses in corn and stock judging in district centers; holding summer schools for teachers; sending out field specialists to give advice to farmers; providing courses of study for agricultural high schools; preparing and sending out bulletins, reports, and circulars; preparing articles for the public press; conducting and publishing an agricultural journal; conducting cooperative experiments in agriculture; providing educational exhibits at fairs; organizing excursions to the college by agricultural associations and individual farmers; conducting experiments and demonstration tests on county poor farms, and organizing farmers' clubs, women's clubs, and boys' and girls' clubs. The president writes: "I do not feel that it will be possible for us at this time to reorganize our work along the lines suggested by the committee. While I am entirely in sympathy with the recommendations made by the committee, they do not fit conditions existing here, and I think it would be unwise to attempt to disturb or reorganize our work at present."

IOWA.

The Iowa State College.—Under provision of an act of assembly of 1906 providing for agricultural extension work and making an appropriation of $15,000 for its maintenance, the trustees of the college organized an agricultural extension department, officered by a superintendent, secretary, stenographer, and six lecturers upon a corresponding number of agricultural subjects—soils, animal husbandry, domestic science, dairying, horticulture, and farm crops. This extension department, under regulations prescribed by the board, sustains the same relation to the division of agriculture and to the institution as a whole as the other agricultural departments. The board have also prescribed that the funds for the agricultural extension department shall be used for "disseminating information and for carrying instruction to parts of the State remote from the college in the form of lectures and demonstrations, demonstration experiments, assistance in short courses, and other forms of agricultural education."

The local expenses incurred in carrying on these lectures, demonstrations, short courses, and other forms of agricultural education are to be borne by the communities in which the meetings are held. The traveling expenses of the lecturers and assistants doing the work are also to be met by the communities or organizations served.

The law prescribes that the $15,000 appropriated by the act shall be expended according to plans agreed upon by the president, the dean of agriculture, and the board of trustees of the college.

The lines of work actually carried out during the year have been quite varied. Short courses were conducted in different parts of the State in which the extension department furnished the teaching force, and the local people took care of all other expenses. Experiment and demonstration work have been carried on in different parts of the State, particularly on the county poor farms. During the summer months a picnic is held at each of these county farms, to which people are invited to see the experiments that are being conducted and to listen to lectures explanatory of this character of work. There has been also cooperation with the county superintendents and the teachers of the State in the introduction of the teaching of agriculture into the public schools. Assistance has been rendered to farmers' institutes, corn clubs, fair associations, etc. Members of the force have accompanied corn specials and dairy special trains, lecturing upon these topics and distributing literature.

The Iowa legislature in 1907 provided a permanent appropriation of $27,000 annually for the extension work, and three additional men will be taken on, one of whom will devote his time exclusively to agricultural extension work in the public schools of the State.

During the past year the total number of applications for help from this department amounted to 1,750. The total number of engagements made was 598. The total number of letters, including circulars and printed matter, mailed from the office was 20,800. Number of letters and circulars received during the year, 13,000. Number of miles traveled by members of the extension department and student assistants, 61,500. Demonstration work has been conducted on 10 of the county farms. Short-course instruction in stock and grain judging and domestic science has been given at 5 places in the State during the past year, and applications have been received from 27 places for short-course work during the coming year. These short courses consist of one week, and the enrollment ranges from 100 to 400. Those who take the work are regularly enrolled and pay a fee of $2 to cover local expenses.

Several of the communities where short courses of this nature have been held have taken the initiative in a movement for local agricultural high schools. The short-course work held at the institution at Ames and at various points in the State has been extremely popular, and a strong sentiment exists in favor of State aid to agricultural high schools.

KANSAS.

The Kansas Agricultural College.—In October, 1905, the board of regents created a separate department of farmers' institutes, electing a superintendent to devote his entire time to this work. This department has charge of all the institute work, as well as of all extension work. Under this direction farmers' institutes and farmers' meetings were held. A series of corn tests has been organized in the several counties, and arrangements have been completed for organizing also a woman's auxiliary. An effort is under way to organize during the coming year 1,000 farmers' clubs, each club to consist of at least 6 men and their wives, to meet at least six times each year in the members' homes. Certificates of organization and affiliation with the Kansas Agricultural College will be sent to each club as soon as the report of its organization is received.

Arrangements are under way for a series of excursions every spring to the agricultural college farm, or to the branch experiment station at Hayes. Traveling libraries of agricultural publications furnished on application to farmers' institutes or farmers' clubs have been arranged for with the State library commission. Winter meetings for farmers and farmers' boys have been planned, also meetings of the Corn Breeders' Association, the State Dairy Association, the Kansas Good Roads Association, the Poland China Breeders, Berkshire Breeders, Aberdeen-Angus Breeders, Draft Horse Breeders, and other agricultural organizations and societies. A corn-and-wheat train was equipped last year with 4 speakers from the college, who delivered 236 addresses to an estimated total attendance of 10,000.

KENTUCKY.

In Kentucky the conduct of farmers' institutes, railway specials, etc., has been under the direction of the State commissioner of agriculture, labor, and statistics. The college assists the commissioner by detailing members of the faculty and of the station staff to deliver lectures and participate in the forms of extension work which he is conducting.

No regularly organized department of agricultural extension has been created in the college, but the members of the faculty, as opportunity offers, take part in lecturing at farmers' institutes, accompanying specials, conducting short courses at the college, assisting at teachers' institutes, conducting correspondence in response to requests for information, preparing articles for the public press, and in directing and assisting in school-garden work.

Plans for future organization of an extension department have not yet been formulated and it will doubtless be some time before this can be done, owing to lack of sufficient appropriation to carry on the work in an effective way.

LOUISIANA.

Southern University and Agricultural and Mechanical College.—The institution has at present about 400 pupils in all grades extending up to and including the highest grade of the normal department. The appropriation for its maintenance from the State and from the Morrill fund is insufficient at present to do more than supply a teaching force for those who are attending classes in the institution. The college, however, makes each year on its own grounds in New Orleans an exhibit of the best products of its own farm, and it has now a standing exhibit of its various kinds of work in the Louisiana State Museum in New Orleans. No extension work in education other than this has been attempted.

MAINE.

University of Maine.—The university has organized a method of extension work through correspondence which has been quite satisfactory. A large number of students have been enrolled in this school. Something also has been done in the way of lecture work before farmers' organizations and in the institutes, but the chief effort of the institution in its extension feature has been to develop the correspondence course.

MARYLAND.

The Maryland Agricultural College.—Under an act of the legislature several years ago the farmers' institute work of the State was placed in control of the college. A director was appointed, and most of the exterior work of the institution since along extension lines has been in connection with the institution. The members of the college faculty participate in the institute work, accompany railroad trains equipped for giving instruction in agriculture, and have done some lecturing in the rural public schools on agricultural subjects.

The college issues a quarterly, 3 copies of which are devoted to extension work among the teachers of the public schools of the State. The results attending the publication of these quarterlies has been most salutary in developing an interest among the teachers in the teaching of the basic principles of agriculture to the rural pupils.

As a direct result of this there is now one well-established agricultural high school at Calvert, Cecil County, Md.

A concerted effort on the part of the people of the State and the agricultural college will be made in January, 1908, to secure from the legislature of the State an appropriation for the purpose of establishing an agricultural high school in each county as a center.

Morgan College.—This institution through one of its branches, the Princess Anne Academy, has organized farmers' institutes on the eastern shore of Maryland. No other form of extension work has been undertaken.

MASSACHUSETTS.

Massachusetts Agricultural College.—The trustees of the college have officially indorsed the idea of inaugurating a division of extension teaching in the institution. The date at which the work can be initiated will depend, however, upon legislative appropriation for its support.

Massachusetts Institute of Technology.—The fact that this institution has not as yet engaged in any form of instruction in agriculture makes it impracticable for it to take any part in carrying out the recommendations of the committee.

MICHIGAN.

Michigan Agricultural College.—The farmers' institute work is under the direct control of the college authorities, represented by a superintendent, and is the principal form of extension work in agriculture that has been undertaken. The importance of the wider work, however, is appreciated, and it is the hope of those in control to take up the matter in a systematic manner in the near future.

MINNESOTA.

The University of Minnesota.—No department specially devoted to agricultural extension work has yet been organized in this institution. The amount of work now done in this direction is extra work assumed by the heads and assistants in various divisions of the department of agriculture in addition to their regular work as instructors. During the past year 27 farmers' meetings were organized by former students of the institution, and each meeting was attended by at least 2 members of the college faculty. About 20 institute meetings in charge of experiment station officers have been held, and speakers from the station have also attended other institutes, devoting a considerable portion of their time to such work. General meetings throughout the State, such as dairy, educational, and good roads conventions are attended by officers from the station. Seed trains operated for 25 days during 1906 were accompanied by 3 of the station force, and 45-minute lectures were given at 192 points, reaching about 30,000 farmers. The dean of the department of agriculture writes: "The whole State is aroused as never before to the need of agricultural education. Farmers, educators, and business men are looking to this institution for information, leadership, and initiative. The immense importance of such work is realized by the officers of this department. The valuable facts obtained by experimentation and research which now reach but a small proportion of the farmers of the State could, under a properly equipped division of agricultural extension work, be extended to thousands of farmers in need of such education, but to do this would require an additional force as well as more funds. There are now at the agricultural experiment stations associations which are doing good work along lines of agricultural extension. These associations need only the support of a well-organized and equipped division of agricultural extension to reach practically every farmer of the State with up-to-date agricultural information."

MISSISSIPPI.

Agricultural and Mechanical College.—This college has charge of the farmers' institute work, and employs a director who is giving practically all of his time to this form of education extension. The president writes: "I am a great believer in this work, and hope some day to see it placed upon an equal footing with the experiment stations of the country and endowed by the National Government."

MISSOURI.

University of Missouri.—Nothing has yet been done officially by this institution along the lines contemplated in the committee's report. The legislature has just appropriated funds which will enable the university to organize for extension work, and as soon as the arrangements can be completed the work will be inaugurated.

Lincoln Institute.—No extension work has been undertaken by this institution except that a farmers' convention was organized last year to meet annually at the college that the farmers of the State may have an opportunity to see such improvements in farming as may be demonstrated there and that the school may have the benefit of their observation and experience. The limited amount of funds at the disposal of the institution has prevented its engaging more actively in this line of work. The president writes that he hopes at some future time to be able to report more progress in this direction.

NEVADA.

University of Nevada.—The university has appointed the faculty of the agricultural and mechanical college as a committee on extension and institute work. The president writes that although he is very much interested in everything that relates to the teaching of agriculture, at present there is so little doing in this direction in Nevada that he fears that they can not do very much for a year or two until a number of farmers are settled upon the land of the Truckee-Carson project.

NEW HAMPSHIRE.

College of Agriculture and the Mechanic Arts.—Nothing definite has yet been formulated in the direction of extension teaching in agriculture by the New Hampshire College of Agriculture and the Mechanic Arts. The local conditions are such as seem to make it inadvisable for the institution to undertake this work at present. The president writes that there is need of a "working plan," and is awaiting suggestions from the standing committee that may aid in solving some of the difficulties that local conditions have brought about.

NEW YORK.

Cornell University.—The college of agriculture in Cornell University has outlined perhaps the most extensive system for extension work in agriculture of any of the land-grant institutions. In a report made by the director of the college of agriculture to the president of the university for the year 1905–6, the field of extension work in agriculture proposed to be covered is presented under 14 divisions: (1) Special course instruction, (2) winter courses, (3) extension work by students, (4) reading courses, (5) school work, (6) experiments and demonstrations on farms, (7) tests and inspections, (8) surveys, (9) inquiries into economic and social questions, (10) cooperation with organizations, (11) organization of extension interests, (12) lectures and itinerant schools, (13) correspondence, and (14) publication.

The director in discussing the functions of each of these divisions defines extension work as "comprising all those teaching enterprises that are not of academic kind and that may reach the people and their problems in the place where the problems are." The view is expressed that the department of extension teaching should be separated from the college work, having its own staff of experts trained specially for this kind of service. Extension work is intended to supplement the regular instruction given in the college classes, and by reason of its separate organization it is believed will in no way lower the standard of collegiate teaching or interfere with its efficiency.

Special course instruction not of full college grade and the short winter courses in general agriculture, dairying, poultry, horticulture, and home economics are regarded as being branches of extension teaching. Work by students in organizing societies and reading clubs in various parts of the State is classed as a separate form of extension work. Reading courses for farmers and for farmers' wives and school work, particularly as it relates to nature study along lines of school gardens, the organization of junior naturalist clubs, and the enrollment of school teachers for correspondence on nature-study subjects are conducted from the university as a center. Experiments and demonstrations on farms are utilized for instructing the cooperator in methods (*a*) to fit him for working out his own problems, (*b*) to demonstrate or determine the value or efficiency of new theories and discoveries, and (*c*) to discover new truth which may be worthy of record in publications by the college of agriculture. Work of this demonstration and experimentation character is under way in 45 counties and upon 1,150 plats, and about 400 persons are engaged in it, embracing the subjects of agronomy, horticulture, entomology, and poultry rearing.

Under "tests and inspections" the department of dairy industry is endeavoring to come in contact, in a helpful way, with the butter and cheese makers, milk shippers, and milk producers of the State. Last summer an officer of the department traveled throughout the State, visiting persons engaged in dairy work, showing where improvements might be made, and when necessary remaining in a locality long enough to see that his suggestions are put into operation. Breeders of cattle and other agricultural associations are frequently assisted through having the traveling expert test the milk of cows in order to determine whether the animal is entitled to be recorded.

Under the head of "Surveys" the college has undertaken to discover the sections of the State best adapted for certain crops and has published bulletins showing these areas so far as they have been located. Expository bulletins on apricot growing, the peach industry, grape diseases and insects, the plum scale, and the causes of apple failures have been published. Each of these treats of a more or less definite area and suggests methods for the improvement of these several industries in the districts designated. Surveys showing improved soil types and their location have been projected, and also one relating to the condition of certain live-stock interests in the central part of the State. This kind of work is capable of wide application and promises great usefulness.

Economic and social questions are made a part of the proposed system of extension investigation and assistance. A study of the actual economic status of agriculture in the State and of the social status of the agriculturist has been undertaken. A system of reporting upon economic and social questions, and a method of correspondence that will reach those who are specially interested in these important subjects have also been projected.

Under "cooperation with organizations" the college of agriculture is taking up the study of the various associations which contribute to the general welfare of country people in an educational way. It has been doing work of this character in connection with the State Grange, which now provides six scholarships in the college of agriculture. It is endeavoring also to assist the fair associations to become educational. Rural churches, village improvement societies, women's clubs, experiment clubs, and all other organized bodies of agricultural people are included in this field of extension work. The college also, under the division of organization of extension interests, is endeavoring to effect a league of the agricultural people into an organization that will promote their interests. An agricultural experimenters' league was organized by students of the college of agriculture in 1903. There are two classes of members—active and associate. The active members are persons who are "residents of the State of New York and who have been enrolled as students in Cornell University or in any college or school of agriculture, or those professionally engaged in agricultural science." Associate membership is open to all who desire to cooperate in the work of the league. The annual dues for an active member is $1 and 50 cents for an associate member. The object of the league is declared to be "the promotion of cooperative experiments in the various departments of farm husbandry, for the promotion of intercourse among those studying farm problems, for the advancement of agricultural education, for the collection and dissemination of data relating to country life, and for the purpose of supporting legislation favorable for promoting these objects."

Another important feature of extension work is that of the traveling lecture work, in which trained men are sent out to deliver addresses and attend institutes and conventions. Much of the matter of conducting correspondence has also been placed in the extension division. This is regarded as a most important department and is systematized so as to provide for prompt attention to all correspondence of whatever kind. Last of all there is the division of publication. At present there are the Junior Industrialist Monthly; 4 quarterly issues of the Home Nature Study Course, with 17 supplements, published during the past year; bulletins of the farmers' reading course issued between November and March; bulletins of the farmers' wives reading course, and such bulletins of the experiment station as record data relating to demonstrations and tests.

These 14 divisions are intended to cover the entire field of extension work, and eventually to comprise a department separate from the regular instruction work in the institution.

NORTH CAROLINA.

College of Agriculture and Mechanic Arts.—A committee on extension in agriculture was organized in the college faculty January 17, 1907. In reporting upon the work the committee makes the following statement and recommendations:

"It is the judgment of the committee that every effort possible should be exerted to extend agricultural teaching, and it is their belief that work in the two following lines should be undertaken at once:

"First, that members of the agricultural faculty visit all of the public schools of Wake County and deliver lectures upon agricultural subjects before the pupils of these schools and before as many of the adults of the district as can be assembled.

"Second, that similar visits and talks upon the value of agricultural education be delivered at all of the colleges and schools of the State, especially preparatory and high schools.

"It is further recommended by the committee that as soon as possible arrangements be made whereby the services of one man may be obtained and given exclusively to agricultural extension work."

This report was adopted by the faculty and about 30 addresses or lectures upon agricultural subjects were given before the various public schools of Wake County. Two lecturers were sent out who traveled through the county in buggies and spent their whole time in this propaganda. The president writes: "I hope that this humble beginning will soon result in organized work."

NORTH DAKOTA.

North Dakota Agricultural College.—There has been organized in the institution a correspondence course, with a superintendent, who is to devote all of his time to this department. A course of instruction will be offered to rural schoolteachers as preparation for the introduction of elementary agriculture into the rural schools of the State, to be extended also to students not able to devote the entire school year to resident work, enabling them to do a portion of the work at their homes. It will also offer courses of study for citizens not able to attend college. Corn-growing contests among the pupils of the rural schools of the different counties, and clover, alfalfa, and other contests will be inaugurated as well.

OHIO.

Ohio State University.—The college of agriculture of the Ohio State University has been carrying on extension work in agriculture for the past two years under the direction of a superintendent of agricultural extension work. During this period there has been organized a large number of boys' and girls' clubs in the rural schools. These clubs have been engaged in studying, planting, and experimenting with corn and other field crops. The girls have been doing a similar work in floriculture, gardening, and yard decoration. There has been published each month an agricultural extension bulletin devoted to the several interests in which the clubs are engaged and to the general cause of rural education. These bulletins have a circulation of about 10,000 per month. The law as to teaching agriculture in elementary and high schools is permissive. Over one-half the townships are teaching agriculture in the elementary grades, and 50 out of 225 township high schools are now teaching agriculture as a part of their science courses. Six villages and cities are offering this subject, especially for those who come from the country and desire the work. The Ohio Teachers' Reading Circle has adopted these extension bulletins as a part of the rural course of reading for teachers.

A summer school in which courses in agriculture are offered is provided for teachers in the rural schools. A winter term of ten weeks beginning in January provides instruction along several distinct lines of agriculture. Members of the faculty of the college of agriculture also accompany railway specials as instructors. During the past academic year three such trains have been operated.

All of the extension work is under the general supervision of the faculty of the college of agriculture.

OKLAHOMA.

Oklahoma Agricultural and Mechanical College.—Extension work by this institution has been limited heretofore to cooperation with the State farmers' institute organization. In March, 1907, a teachers' correspondence course in agriculture, covering two years, was organized, and has enrolled a large number of the more ambitious teachers of the rural schools. The president writes that the recommendations of the committee on extension work of the Association of American Agricultural Colleges and Experiment Stations shall have careful consideration.

PENNSYLVANIA.

The Pennsylvania State College.—A correspondence course has been conducted by the college for several years with satisfactory results, having had several thousand students on its rolls during its existence. The college also furnishes lecturers each year for the farmers' institute work which is conducted by the State department of agriculture.

The entire subject of extension work was considered by the trustees last year with a view to extending it and increasing its usefulness. The result is that an expert has been employed to travel through the State representing the dairy department to give practical instruction to dairymen as to the best methods of improving their work. A superintendent of extension work has also recently been elected, and it is expected that a complete system of extension work will be organized and put in operation during the coming year.

In December, 1906, a school of agriculture, attended by 187 farmers, representing 38 counties of the State, was held at the institution for seven days. The time each day from 8 o'clock in the morning until 5 in the afternoon was taken up with class-room and practicum work, followed by addresses of more popular character each night. The enthusiasm with which this teaching was received by those in attendance justifies the expectation that the number coming to the institution for similar instruction next year will be largely increased. When completed the department of extension work is expected to cover the entire field of exterior instruction, limited in extent only by the financial ability of the college.

A specialist in horticulture as it relates to commercial orcharding is making a tour of the State, studying conditions and providing for a series of experiments of a practical sort by a number of orchardists throughout the Commonwealth. The effort is meeting with very pronounced satisfaction on the part of fruit growers and is doing good in giving the fruit men a better idea of the capabilities of Pennsylvania as a fruit-growing State.

RHODE ISLAND.

Rhode Island College of Agriculture and Mechanic Arts.—The report on extension work by the college published in August, 1906, devotes about 12 pages to giving information respecting the work that is being conducted and the methods that have been inaugurated for carrying it on. Extension instruction has been classified under the following titles or subdivisions: (1) Demonstrations, (2) cooperative experiments, (3) extension lectures, (4) special lectures, (5) a carpet-bag campaign, (6) correspondence courses, (7) popular bulletins, (8) traveling libraries, (9) the assistance of the Grange, (10) nature study, (11) school gardens, (12) correspondence, (13) general office work, and (14) miscellaneous work.

These titles indicate the general character of the work. The demonstration feature is for the purpose of acquainting farmers with the most approved methods of performing certain operations, as spraying, stock fumigation, the identifying of plant diseases and injurious insects, prescribing and applying remedies, outlining plans for soil improvement, testing the productive capacity of dairy cows, giving instruction in forest planting, and similar operations in agriculture. The cooperative experiments are for the purpose of encouraging farmers to adopt principles and practices already in operation on the station and college farm, orchard, and garden. Under extension lectures members of the faculty have assisted in farmers' institutes, in conventions, and other rural societies, the only cost to the organization or society being the traveling expenses of the lecturer. A course of special lectures has been undertaken with satisfactory results.

The carpet-bag campaign is an innovation in extension teaching. The plan is to send some one who, by training and experience, is able to appreciate the problems which the average farmer has to meet, and have him go from house to house and engage farmers in conversation and hold neighborhood meetings for the mutual discussion of agricultural problems. The proposition is, first, to give instruction in agricultural principles, and next to discover the chief difficulties that exist in the various communities and the attitude of the average farmer toward his vocation.

The correspondence courses are upon lines very similar to those conducted by other institutions, and the popular bulletins are expositions of agricultural methods and principles. The traveling library is another line of work which the institution hopes to establish and maintain.

The granges of the State have proven a factor of great importance in extension work. They provide community centers where lecturers can go and secure audiences of intelligent farmers who are interested in the development of their occupation. The fact that granges are established in almost all rural communities throughout the State enables the college to readily reach all sections with literature and instructors. Nature-study work has been undertaken with a view to interesting the children in the public schools by enabling them to know more about the life that surrounds them, and thereby beget love for the country and for the occupations that the country provides. Bands of children have been organized in many of the schools, and from each child at least one report is expected each year. In recognition of this report a small certificate, in the form of a card representing some view of Rhode Island scenery and containing a short statement of the fact that the required reports have been sent in, is awarded. A nature leaflet, specially prepared, is sent out to the children each month during the eight months of the school year. In the past these leaflets have been prepared by members of the college force, but it is proposed in the future to enlist also in this work teachers in the various schools throughout the State.

School gardens comprise another section of extension work in which the college is engaged. The gardens, as recommended, consist of individual plats, 10 by 20 feet in dimensions, one, and sometimes two, being given to each gardener. As preparation for this work it is proposed to invite teachers of the country schools to visit the college in the summer, and join in excursions of investigation of the flora, fauna, and geological features of the region. By familiarizing the teachers with these subjects it is believed that their interest in school-garden work and nature study in other forms will be greatly increased.

The report states that perhaps the greatest increase in the extension work of the year has been through correspondence. The number of letters has been doubled each season since the work began, and the inquiries are of such character as to require considerable time to properly answer. The work is being organized as a separate feature of extension to be conducted by skilled specialists, the same as extension work along other lines.

The lack of sufficient funds is the chief embarrassment in carrying on this extension feature to the extent that the needs of the State require.

SOUTH CAROLINA.

Clemson Agricultural College.—The trustees of Clemson College appropriate between $3,000 and $4,000 a year with which to pay the expenses of the farmers' institute work, which the college conducts. A director of institutes, who is paid a salary by the college, and prominent scientific lecturers and practical growers are employed to give instruction to farmers on subjects relating to their profession. The railways of the State have been assisting the institution in its work of education extension, furnishing coaches which the college equips with lecturers and material, the companies transporting them free of cost over their lines. The president reported, January 7, 1907, that two cars were then out on a tour of instruction through the southern half of the State, to be gone for about two months, and that in the summer the same process will be carried on in the upper portion of the State. They are sidetracked as long as the farmers in any particular locality desire information from the officials. It is a school on wheels, and during the year the college devotes from three to four months' steady work to giving this outside instruction.

During the summer vacation from 1,000 to 1,500 farmers assemble annually at the college for the study of agricultural and industrial problems. It is the purpose of the college to enlarge the scope of the farmers' institutes so as to reach the entire population of the State, including the mill people, the school children, and all who are interested in scientific industrial education.

Colored Normal Industrial Agricultural and Mechanical College.—The president reports that the suggestions of the standing committee on extension work meet his hearty approval, but that the college is without funds to prosecute the work.

SOUTH DAKOTA.

Agricultural College.—The only form of extension work undertaken by the South Dakota Agricultural College is in connection with the farmers' institute, which is under the control of a committee consisting of two members of the State board of regents and the president of the college. The president writes that it is his desire to organize such a department as the committee of the Association of American Agricultural Colleges and Experiment Stations has recommended, and hopes to have it in operation by the beginning of the college year in September, 1908. Lack of funds sufficient for establishing such a department prevents it being organized at an earlier date.

TENNESSEE.

The University of Tennessee.—The president states that the Tennessee legislature at its recent session appropriated money for inaugurating this work along lines suggested by the committee of the Association of Agricultural Colleges and Experiment Stations.

TEXAS.

Agricultural and Mechanical College of Texas.—The college is asking the legislature to appropriate $6,000 annually for carrying on agricultural extension work. If this appropriation is granted it is expected to establish a department of agricultural extension in the institution, employing a chief for the department, an assistant, and a clerk, and to make the work a permanent feature of the institution. The college has done some extension work in the way of institute lecturing, visiting public schools, and giving lectures on the subject of teaching agriculture in these schools, but this has never been a regularly organized feature of the work of the institution.

VIRGINIA.

Hampton Normal and Agricultural College.—The agricultural extension work being done under the auspices of the normal and agricultural institute consists at present of one man, who is giving all of his time to demonstration work. It is the plan of the institute to extend the field of this work as soon as practicable. A committee of three members of the institute has charge of this extension work. There is also the lecture service which the agricultural institute supplies for farmers' institute work and for rendering assistance at agricultural conferences and before associations of farmers.

WEST VIRGINIA.

West Virginia University.—A committee on extension work in agriculture has been appointed by the university and has recommended to the president and board of regents that an extension department be established in this institution, and that a capable man be put in charge of the work.

For a number of years past members of the faculty of the college have been engaged in assisting in conducting work of extension character, partly originated by the institution and partly in cooperation with other organizations. The lines of work consisted in conducting reading courses, giving instruction by correspondence, assisting in the farmers' institutes, holding agricultural schools, conducting dairy schools, addressing grange meetings, preparing newspaper articles, and organizing short-course schools at the university.

WYOMING.

University of Wyoming.—Extension work by the University of Wyoming has been in the direction of the conducting of farmers' institutes. An appropriation of $2,500 for this purpose was made covering the next biennial period. The law requires that at least one farmers' institute shall be held in each county in the State each year. As yet the work has not been systematized or made a separate department, but has been conducted under the direction and with the assistance of the regular staff of the college and the station.

Respectfully submitted.

Kenyon L. Butterfield,
Charles R. Van Hise,
Charles F. Curtiss,
Andrew M. Soule,
W. M. Hays,
B. W. Kilgore,
Committee.

Carnegie Foundation and Land-grant Colleges.

On motion of G. E. Fellows, of Maine, H. C. White, chairman of the executive committee, was authorized to continue his efforts to secure participation of the land-grant colleges in the Carnegie Foundation.

Resolution of Thanks to Senator Nelson.

On motion of C. D. Woods, of Maine, W. A. Henry of Wisconsin, W. E. Stone of Indiana, and H. Snyder of Minnesota, were appointed a committee to draw up a resolution of thanks to Senator Nelson for his aid in securing additional appropriations for the land-grant colleges.

At this point H. J. Waters, of Missouri, and E. R. Nichols, of Kansas, presented resolutions, which, with the action taken on them, are given on pp. 36, 37.

The association, at 12.20 p. m., adjourned to meet at 8 p. m.

EVENING SESSION, TUESDAY, MAY 28, 1907.

The association was called to order, at 8 o'clock p. m., by Vice-President M. A. Scovell, of Kentucky.

ADDRESS OF THE PRESIDENT OF THE ASSOCIATION.

The address of the president of the association, L. H. Bailey, of New York, delivered at this session of the convention, was ordered separately printed by the association for immediate distribution. The subject of the address, "The State and the Farmer," was discussed from the standpoint of self-help and governmental assistance and what it is wise and just for the State to do in aid of the farmer. Much stress was laid upon the importance of personal and local initiative in solving difficulties and effecting reforms.

The session, at 10 p. m., adjourned to meet at 9 o'clock a. m., Wednesday, May 29, 1907.

MORNING SESSION, WEDNESDAY, MAY 29, 1907.

The session of the association was called to order, at 9 o'clock a. m., by President L. H. Bailey, of New York.

NUTRITION INVESTIGATIONS OF THE OFFICE OF EXPERIMENT STATIONS.

The following resolution offered by H. J. Waters, of Missouri, was taken up for consideration:

Resolved, That this association believes that the United States Department of Agriculture should continue to conduct investigations on human nutrition and make the results promptly available for the use of colleges and schools, as well as of our people generally, and the executive committee should therefore take such measures as will in its judgment best aid the Secretary of Agriculture in putting work in this line on an effective and permanent footing.

A. C. TRUE, of Washington, D. C. The Department of Agriculture has been conducting investigations on human nutrition for thirteen or fourteen years, and, as many of you know, has built up on the basis of those investigations a considerable literature, scientific and popular. The work, however, will now be at least interrupted because of the action of Congress at the last session. The matter came up on a point of order made in the House that such work was not within the terms of the organic act under which the Department is operating, or, in other words, that it was not a subject pertinent to agriculture. The chairman of the Committee of the Whole ruled that that point of order was well taken. The item, therefore, went out of the appropriation, and the bill was passed without it in the House. It went to the Senate and the Senate restored the item, but it was endangered again in conference and seemed likely to be lost altogether. At that point the Secretary of Agriculture used his influence to keep a certain portion of the appropriation, and we still have the item in the bill in a way, but the money can only be used for packing, transporting, and storing our apparatus. We have been, as many of you know, conducting these investigations in different parts of the country, at different colleges and stations, and we have a certain amount of apparatus, especially the respiration calorimeter, and that will now be brought to Washington and stored there, and that is as far as we can go during the next fiscal year. So that the question before the Secretary is whether he will close out these investigations, or whether he will make an effort at the next session of Congress to have the matter restored, and, if he has not already authority in law to carry on such investigations under simple appropriations, to get the necessary authority.

On motion of H. C. White, of Georgia, the resolution was adopted.

AGRICULTURAL EDUCATION WORK OF THE OFFICE OF EXPERIMENT STATIONS.

The following resolution, introduced by E. R. Nichols, of Kansas, was taken up:

> Whereas there has been a large expenditure of money and energy in the acquisition of knowledge of rural affairs and in the organization of country life education in collegiate, secondary, and primary schools; also in short courses, in farmers' institutes, in traveling schools, and in other forms of extension instruction; and
>
> Whereas there is now manifest a determination on the part of the American people to rapidly multiply the agencies for extending this kind of practical education: Therefore be it
>
> *Resolved*, That the Association of American Agricultural Colleges and Experiment Stations urges upon the Congress liberal appropriations to enlarge the work of the Office of Experiment Stations along the lines of investigations and publications in relation to methods of [technical] [a] instruction in agriculture relating to the farm, to the farm home, and to rural interests generally.

A. C. **TRUE**, of Washington, D. C. These resolutions relate to the work of the Office of Experiment Stations, and I think the association should understand the situation before voting on the proposition. This Office has had for a number of years a small appropriation for work in agricultural education, but the demand for such work has steadily grown and is at present far beyond what can be done with the small appropriation of $5,000 now provided for it. At the last meeting of this association a resolution of somewhat similar tenor was adopted, and an effort was made to increase the appropriation. The Secretary estimated last year $20,000 for this work, but in the final outcome no increase was received. If the association, which has been intimately associated with us in this work, desires that we should extend it and make it effective, it is, in my judgment, absolutely necessary that we should have more funds to carry it on.

E. R. **NICHOLS**, of Kansas. Many of the agricultural colleges are just beginning extension work of various kinds, and it would be well to concentrate and harmonize the efforts of the different institutions. Hence the resolution.

On motion of M. A. Scovell, of Kentucky, the word "technical" in the last clause of the resolution was stricken out. As thus amended the resolution was adopted.

PEACE MEMORIAL.

O. W. Smith was given the courtesy of the floor to present and explain a memorial to The Hague conference in the interest of peace and arbitration treaties.

No official action was taken on this matter, but at the suggestion of W. E. Stone, of Indiana, the memorial was left upon the secretary's table, that those members who wished to sign it might have opportunity to do so.

REPORT OF COMMITTEE ON INSTRUCTION IN AGRICULTURE.

A. C. **TRUE**, of Washington, D. C. Since the Baton Rouge meeting this committee has followed the programme of work outlined at that time. The report on elementary instruction in agronomy, prepared in accordance with the recommendations of the committee by Mr. Crosby, of the Office of Experiment Stations, has been submitted to examination by a considerable number of scientists and teachers, a number of exercises therein have been tested by us in school classes, and after careful revision by the author has been published as Office of Experiment Stations Bulletin No. 186. Several points have been raised in the correspondence we had with different people about the bulletin. This report is not intended to be a text-book. It is, as it states on the title page, rather a series of exercises in elementary agriculture. While it is for elementary instruction, it is not expected that it will meet the needs of the poorest kind of rural schools. Therefore those who are interested in its distribution should deal carefully with the matter or else disappointment will follow. It is prepared for the better class of rural schools, for the consolidated schools or schools that have added one or two years of somewhat higher work than the ordinary school programme, and for the lower range of high schools. I am of the opinion that this bulletin may be used with advantage in the new high schools that are starting up in the rural regions, in many parts of the country where the high school is still in its beginning. As regards the distribution of the bulletin, the Department of Agriculture will send it out to teachers and others who are directly interested in the subject as far as the supply will permit. It is not in the Farmer's Bulletin series and therefore can not, under Department regulations and the laws governing printing, be printed in immense editions, but it is desired to make it as widely useful as possible and to send it to those persons who can really use it to advantage.

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[a] The word "technical" was omitted from resolution as adopted.

The secondary course in agronomy referred to in the previous report of the committee has also been submitted for criticism to a number of scientists and teachers, and has been worked over by the subcommittee with the assistance of Dr. G. L. Warren, of Cornell University, and has been approved for publication by the committee, with the understanding that the Department of Agriculture will be asked to print it at an early date.

This course was intended to be strictly of secondary grade from what may be called the standard of high schools in the North and East. No attempt has been made by the committee to make this secondary course of a low grade to meet the needs of the weaker high schools. The idea has been that these two publications would supplement each other; that the secondary course would have a good standard course covering a year of high school work. If the high school was not able to measure up to that standard, then it could use the more elementary course. This was done for this reason: There is a feeling among schoolmen that agriculture is not a proper subject for high school instruction, because it can not be put in form which will make it a stiff enough course for high school work as compared with courses in the natural sciences and other subjects. An attempt is made in this bulletin to show that a good, solid, and substantial course in agriculture, suited to high schools, can be prepared.

The subcommittees on college courses in rural engineering and mechanics have continued their inquiries and reported progress. The committee has voted to take up during the coming year the preparation of elementary and secondary courses in animal production and related topics.

The report was accepted.

Report of Committee on Experiment Station Organization and Policy.

The report on this subject was presented by E. Davenport, of Illinois, chairman, as follows:

During the year your committee has received complaints from members of station staffs and college faculties that they find it impossible, without what seems an unnecessary effort, to obtain the bulletins of some stations.

To facilitate the distribution of publications to station and college workers, the Office of Experiment Stations several years ago began to furnish on request printed lists, revised to date, of station workers. This list is in form to be used on either the Dick or Horton mailers or can be used simply as an address list.

Inquiry discloses the fact that somewhat more than two-thirds of the stations avail themselves of this "official list." It is a significant fact that the trouble of nonreceipt of bulletins is practically confined to the third of the stations that do not use the list.

In the opinion of your committee, sending bulletins to station, college, and institute workers in the different States is much more than an act of comity. These are the best and the most intelligent users of station literature, and the results published in the bulletins are by means of these readers more widely, quickly, and thoroughly diffused among the agricultural public than in any other way.

To the objection which some stations make to sending their bulletins in any considerable number outside the bounds of their own State, the fact that the stations are maintained by national funds and that they have free use of the mails seems conclusive.

Your committee recommends—

That the stations and workers keep the Office of Experiment Stations promptly advised of all changes on station staffs and agricultural faculties in order that the "official list" may be kept constantly revised;

That the association urges each station to make use of the official mailing list; and

That the Director of the Office of Experiment Stations be asked to call the attention of directors of stations not using this list to this action of the association.

The unprecedented demand for men trained in agricultural subjects is resulting in the appointment to rather important positions, with salaries out of all proportion to their experience or their scholarship, of young men fresh from graduation and necessarily deficient in their training.

The agricultural colleges are primarily fitting their graduates, not for investigators and teachers, but for practical work in husbandry. Good as the courses are for this purpose, they are only preparatory to the more advanced study needed by the investigator and the teacher. They do not, nor can they perhaps, be expected in their undergraduate work to furnish the atmosphere best adapted to the true scientific spirit and ideals.

Your committee views with deep concern this influx of men insufficiently prepared by training and by spirit into positions of importance in station and college work and recommends that this association urge upon the appointing bodies the importance of securing men with the widest possible education and training, and upon the institutions that they supply the proper conceptions of scholarship, which under present conditions the young men can hardly be expected to acquire as undergraduates, and that they make it clear to young men that satisfactory permanent service can come only through the best preparation the world offers.

And it is especially recommended when institutions find themselves so situated as to be compelled to advance to responsible positions and good salary a man of inadequate preparation, that the arrangement shall include a definite understanding to the effect that he shall at once enter upon graduate work in the institution in which he is employed wherever this is at all practicable, and that in any event there should be definite plans for his temporary relief in the very near future for the purpose of engaging in graduate study in the best universities of the world.

Whereas the Office of Experiment Stations is the agency in the Department of Agriculture for the furtherance of the various interests of the experiment stations in their relations to the National Government; and

Whereas the rapid growth of the experiment stations and the importance of these relations has greatly increased, especially under recent National legislation, to such an extent as to call for the organization of the Office of Experiment Stations on a broader basis which would more fittingly express the present importance and position of the interests involved and place it on a footing of equal rank with the bureaus of the Department;

Therefore this committee recommends that the association request its executive committee to confer with the honorable Secretary of Agriculture, expressing the association's high appreciation of the work of the Office of Experiment Stations, and requesting him to consider the elevation of the office to the rank and dignity of a bureau.

E. DAVENPORT,
C. D. WOODS,
W. A. HENRY,
H. J. WATERS,
M. A. SCOVELL,
C. E. THORNE,
Committee.

T. F. HUNT, of New York. I would like to express the opinion, without trying to controvert anything that is in the report, that there never was a time when such good men were graduated from the agricultural colleges of the country as at the present time. The inference seemed to go out that our men are very poorly prepared, and therefore, perhaps, we have not been making progress. I have been for the past fifteen years studying the young men who have graduated from our agricultural colleges. I am convinced that we have been making great progress with regard to the character of the men whom we are graduating, and I would like to have that point of view go upon record, in order that there shall be no misapprehension, perhaps, a hundred years from this time, when somebody reads this report.

The advisability of a change of name of the office, to indicate its enlarged functions proposed in connection with agricultural education, was discussed by K. L. Butterfield, of Massachusetts, and E. Davenport, of Illinois. The latter also explained that the committee report intended no reflection upon the caliber of the student graduating from the agricultural colleges. The point made was that the undergraduate courses are not designed for experiment station work, and when it is proposed, as has been the case, to take men who have had only undergraduate work and put them at the head of departments, it is certainly time to raise the question of their fitness for such responsible positions.

The report was accepted and its recommendation adopted.

REPORT OF COMMITTEE ON GRADUATE STUDY.

M. H. Buckham, of Vermont, presented this report, as follows:

The committee has little to report since the Baton Rouge meeting of the association, except to inform the association that it has accepted the invitation of Cornell University and the New York State Experiment Station as the holding institutions for the school of 1908. Dr. A. C. True has been designated as dean of this coming session. Doctor True, in conference with the committee, has laid out a tentative plan, the central feature of which is work in the interrelations of the chemical and biological groups of studies. Negotiations with prospective members of the faculty are progressing, and it is hoped to have the roster and plan complete within a few weeks.

The committee desires to impress on the members of the association the great importance of this graduate school to the educational and investigational enterprises in which we are all engaged, and to urge them to make plans and preparations for it now, even though a year ahead. Work in the graduate school is not to be entered on lightly either by teacher or student. The committee hopes that each succeeding session will bring the work of the school nearer to real post-graduate study in every one of its departments. It is particularly desirable that the experienced teachers and investigators contribute their services to the school in order to give it the standing and point of view that such a school needs.

The committee also desires to call special attention to the necessity of making the contributions of money for each of the two years. Contributions due July 1, 1907, and July 1, 1908, are to be applied to the forthcoming school. The committee believes that every institution having membership in the association needs the aid that participation in such a school may render and that it should be actively identified with the enterprise.

W. O. THOMPSON.
BROWN AYRES.
L. H. BAILEY.
H. P. ARMSBY.
M. H. BUCKHAM.
R. H. JESSE.

After a very full discussion of the desirability of more general and prompt contribution to the fund for the maintenance of the graduate school on the part of the institutions represented in the association, the advisability of increasing the amount of the contribution and of levying it in form of an assessment, and like points connected with the finances of the graduate school, it was voted that each agricultural college and separate experiment station be requested to contribute $25 in support of the graduate school on or before the 1st of July, 1907, and annually thereafter.

J. Craig, of New York, raised the question as to whether it might not be possible for the committee to standardize graduate work in the colleges, so that, for example, the master's degree in one institution shall be equal to a master's degree in another institution.

A. C. True, of Washington, D. C., deprecated the fact that fewer mature men attended the second session of the school than were present at the first, and suggested that it would be well for those who are connected with the different institutions to consider whether it is not feasible to have mature men come as well as those who are younger in the work, so that there may be a fair representation of all classes of men engaged in the work of the colleges and stations. The work of the graduate school was not so much the giving of formal courses as it was the discussion of up-to-date questions pertaining to the work, and he presumed that at the coming session, as at the previous session, men would be welcome to come for short periods if they could not come for the whole session.

The report was adopted.

REPORT OF COMMISSION ON SCIENTIFIC RESEARCH.

W. H. JORDAN, of New York. At the Baton Rouge meeting the following resolution was adopted:

> *Resolved*, That there be appointed by the incoming president of this association a commission consisting of five persons, two representing the research efforts of this association, one representing the United States Department of Agriculture, and two representative scientific men not connected with official agricultural investigation; the duty of which shall be to inquire into and report to this association the organization and policy that in the opinion of the commission should prevail in the expenditure of public money provided for scientific experimentation and research in the interests of agriculture, to the end that such funds shall be applied in the most economical, efficient, and worthy manner to the production of results of permanent value.

The appointment of the commission was left with the incoming president, who appointed as that commission David Starr Jordan, of Leland Stanford University; Carroll D. Wright, of Massachusetts; Gifford Pinchot, of the United States Department of Agriculture; H. P. Armsby, of Pennsylvania, and W. H. Jordan, of New York. The commission held one meeting in the city of Washington in the early spring, and organized with David Starr Jordan as chairman and W. H. Jordan as secretary. The work of the commission was then outlined, and after a discussion of its function and scope, the chairman appointed two subcommittees, one of which should take more especially into consideration the side of research in technical science, and the other subcommittee the sociological and economic relations of research as conducted by colleges and stations. It is expected that the commission will hold another session in November of this year, and will make its final report to the association at the fall meeting of 1908.

The report was accepted and the committee continued.

The following telegram from the Chief of Staff of the United States Army was read:

> Owing to important business with Secretary of War it will be impossible for me to attend meeting of association at Lansing this year. Regret this exceedingly and hope to be able to attend next year.
>
> J. Franklin Bell, *Chief of Staff.*

On motion of H. C. White, of Georgia, the association expressed great regret at the inability of General Bell to attend the present meeting and the hope that he might attend the next annual convention.

Address of Prof. Robert Wallace, of Edinburgh University.

Robert Wallace, professor of agriculture and rural economy, University of Edinburgh, was introduced, and spoke as follows:

Mr. President and Gentlemen: When the honor was done me of asking me to address this meeting, I thought probably the best subject might be that of "Live stock of Great Britain," in connection with which, perhaps, my name is best known in this country. But before speaking on that subject I should like to say a few words with regard to education in my own country. Things have transpired since I made my decision which have made me feel that probably a few preliminary remarks on the agricultural education of the United Kingdom of Great Britain and Ireland might be a fitting introduction to the words that I shall say on live stock. The chair which I have the honor to hold in Edinburgh University is the oldest institution of the kind in the United Kingdom. It dates back to 1790; one hundred and seventeen years it has been in existence, and it has only had four occupants, each of my three predecessors holding the post for over thirty years. I have held it for twenty-two, and I mean, gentlemen, to break the record.

My predecessor was Prof. John Wilson, whose book on Farm Crops is still a standard work in the United Kingdom, although much out of date. David Lowe's name, I think, must be known to all those interested in stock, as he was the author of a great book on farm animals. The originals of the plates of that book adorn the walls of my department and consist of 100 oil paintings, original portraits of selected live stock from all parts of the United Kingdom, which after seventy years form a very important record of the character of the farm animals of the time. My other predecessor, Coventry, was best known from having been the first occupant of the chair. He did not write much. He was a farmer, but a man who did good pioneer work in education.

My university duties extend five months in the year. After that the practice is to send the students to farms or to other scientific work of the university; so that I am free to range the world over in pursuit of new information of importance in connection with the work of my chair. It has been my fate to visit nearly all the important colonies of the British Empire and to have been in this great country of yours some five or six or seven times—I do not know how many. But in these wanderings I have been able to collect much information that has been of service to me. When I entered as a professor of agriculture at Cirencester College, over twenty-five years ago, there were only four agricultural schools in the United Kingdom, the University of Edinburgh being, as I have said, the oldest. At the present time there are about twenty-five or twenty-six—I do not know exactly the number. They are mostly subsidized by Government money, and a great many of them are under popular control. Some six universities and university colleges have followed the example set by my own university twenty-one years ago in giving degrees, and these form what we call the highest stamp of qualification in the United Kingdom. The other colleges have to be contented with diplomas as their marks of distinction.

The men who take degrees have the outlet of government appointments, and well-paid appointments, in our Indian empire and in our colonial empire. I am glad to say that in the Indian service, at last, after much delay, the government authorities are establishing a great agricultural department, over which no less than sixty to seventy Englishmen and Scotchmen will preside, besides native assistants.

There is another feature of our work in agricultural education which will perhaps interest you. We have thought it necessary to encourage students to go in for postgraduate study. We have for years sent a number to Germany. More recently we have broken out in the direction of the West, and we are directing them to Canada and to the United States, and some have done extremely well. I am glad to say from the information I have received since I came to this country that their work is most encouraging, and I hope to be able to send more in the future.

There is one other subject you would like to hear my opinion about, and that is the practical teaching of farm work. I am connected with an institution which possesses no farm, and we do not pretend to teach practical agriculture. I belong to the group of teachers who believe that practical agriculture is best taught—some of us think that it can only be taught—on a farm conducted on commercial principles. We do not care what kind of a farm it is so long as it is a well-managed proposition, conducted on commercial lines, with at the end of the year a balance on the right side of the accounts. If one or two men go to such a place, we believe they will learn much more agriculture than if grouped ten, twenty, thirty, or more together on any farm whatever. As soon as a large number of students are grouped together the work they do is not the practical work of the farm, and therefore a student is not learning the work which he is going to follow afterwards. It may be work that is practical in a way, but it is so ordered that it is no longer farm work, and therefore we believe that the way for students to get the best practical experience is to spend at least a year at practical work on an ordinary farm, where they will learn, as the farmer's son learns, those details which it is impossible to introduce into any scientific course.

This leads me to the subject I first intended to speak on—the "Live stock of our British Empire." One of the chief results of my foreign investigations in connection with my visit to British India was the discovery that there is a distinct relation between the color of the skins of animals and the climate. It was well known that this relation existed in connection with human beings, but I believe I was the first Englishman or Scotchman who suspected that there was a general relation between the color of the animals in the Tropics and the climate to which they are subjected. I found that the cattle of India had very dark skins underneath white hair, and on extending the investigations to other animals I found that the law was universal. This I have also confirmed in Africa. We find buffaloes are black skinned, elephants are black skinned, Arabian horses are black skinned, zebras have black skin under their white bands. The antelopes of central Africa, all except the bush buck, have black skins underneath their variously colored hair. This made me think it necessary to apply the lesson to our breeding of live stock, and looking around I found that nature follows a definite law in relation to cultivated stock. I found in South Africa that the Africander cattle are dark red and therefore have dark skins that protect them against the heat of the sun. Your Texas cattle are not white-skinned cattle, neither are the Criolo cattle of the Argentine, both from the same Spanish origin. I found that the scrub cattle of Australia did not run to white; they run to whole dark colors. And therefore I argue that breeders, especially when the cattle are placed under conditions where they are exposed to hot sun, should follow nature's example and breed animals that conform to this general law. I found, however, that in Canada, where the sun is pretty hot at times, and in the United States, you have been making several mistakes, and we breeders at home have been making mistakes, looking forward to the fact that so many well-bred animals go abroad to warm climates. I am old enough to remember when the Ayrshire breed of cattle was dark, and it is flying in the face of nature to breed them in this country with white skins.

The same remark applies to pigs. Those of you who come from the Southern States know that white pigs are not able to withstand the hot sun. They burn and blister as fair men do. We have just discovered at home, among many discoveries made lately, a local breed of pigs which should take the place of certain other breeds as bacon pigs, namely, the Large Black, a breed that you hardly hear anything of. It has been bred for a long time in local parts of our country and it will ultimately be a prominent breed among the bacon pigs of this country. It is large and of good quality. I believe in Canada they have had some pigs of this breed that have been anything but a success, but that is not the fault of the breed as a whole; it is the fault of the strain tried or probably of local conditions.

There is another breed of animals, the Clydesdale. We, in Scotland, have been breeding Clydesdales with white feet and white legs, and every one knows that a white foot is more delicate and is softer than a dark one. The remark also applies to the white leg. When I visited J. B. Haggin's great ranch in California, seventeen years ago, I found it was there unprofitable to breed horses with white legs, as they were allowed to go into water. They would wade in and wet their legs and noses, and when they came out the white parts blistered in the sun. We have been learning the lesson slowly. I put it as plainly as possible before our breeders, but they would not listen, and the result is that the Clydesdale horse, a very active and a durable horse when represented by properly colored animals is here worsted by the Percheron breed. That is one of the things that I shall tell the Clydesdale breeders when I get home, that they have lost their opportunity and sacrificed one of the finest markets once open to them for the mere fancy of breeding white legs and white noses. One gentleman told me since I came to this part of the country, speaking of the susceptibility to injury of a white-legged horse, that there is a saying:

"With one white foot, buy him. With two white feet try him. With three white feet and a white nose, skin him and give him to the crows."

Adages always have a meaning, and this one goes to confirm my conviction that white skins are detrimental in hot countries to the animals which own them.

This leads me to talk of the breed of wild white cattle which we have at home, because in the study of this breed we have, perhaps, the finest possible illustration of the injury of too close inbreeding. These so-called white cattle have dark points. The natural color of the points is black, but in a few cases, the ears, the noses, and the socks are brown or red. Storer, who was the great authority on this breed—because I look upon the remnants I propose to deal with as belonging to one family or breed—points to no less than forty different herds that were at one time, perhaps six or seven hundred years ago, imprisoned or inclosed in parks in small numbers, in small areas. All that remains of this grand display of forty sections of the ancient cattle of the United Kingdom, are four single miserable bunches, degenerated and degraded by a constant system of inbreeding. All the rest have disappeared mainly through that one influence, and but for the accident of outside animals getting into the parks, I am convinced the whole of these beasts would have disappeared long before this.

There is a difference of opinion as to the origin of these cattle. I am one of those who believe that the white herds in question were descended directly from the wild cattle that ranged the forests of northern Europe, including the forests of the north of Scotland at the time of Cæsar, beasts that were recorded to be the size of an elephant. With the evidence supplied by the horn cores and other remains that we have in the United Kingdom, I would say that the size was no exaggeration. Others believe (Boyd Dawkins and McKenna Hughes, archæological authorities) that all the wild beasts in the British Islands died out and that the white cattle of the country are the descendants of others imported by the Romans. I think it is going quite out of the way to get an explanation of their origin to argue in that way. I do not think that the animals in so many as forty different centers could possibly have all had one single coloring, namely, white with dark points, if these had been chance divergencies from civilization, that is, had these cattle broken away from civilization. We have, in addition to the white Park cattle, which are truly wild animals, a polled breed that belongs, very likely, to a kindred strain. They are all domesticated and a number of them are famous as milch cattle. There exist some four or five different herds reduced in numbers, and, of course, suffering from inbreeding. It is now extremely difficult to find bulls good enough to maintain the old standard of quality of the breed. They probably came to England from an ancient mountain breed in Sweden. There was a great deal of communication between the Scandinavians and the people of our east coast country, and it is quite probable that they brought some of their cattle with them.

This observation on white cattle leads up to an interesting fact with regard to breeding, and I have had some specimens bearing on the matter shown to me since I came to this country. We have distinct colorings when we cross two breeds together, and we can often predict very nearly what that coloring will be. For instance, we cross a white Shorthorn bull and a black Polled

Galloway or Aberdeen Angus cow, and we get a blue-gray; at least a great many of them are gray, but when you get to the second cross we can not be sure what the color will be. A very common occurence, when cross progeny of distinct breeds like these are mated, is to get white animals with the dark points. This law applies to cows with very distinct colorings, such as blue-grays united with a Shorthorn bull. It also applies to the cross progeny of Brittany cattle united with Shetlanders. This shows that many breeds, even those so divergent as the Brittany, the Shetland, the Shorthorn, and the Polled Angus and Galloway, trace back to the old stock of white wild cattle of the country with the dark points. I think it is a very interesting fact, indeed, and one which comes out prominently on this side of the water as well as on the other side.

Now, one unique feature of our country is the extraordinary number of breeds of domestic animals that it possesses. There is no country in the world that has such a number of distinct breeds of cattle, horses, sheep, and swine as the United Kingdom of Great Britain and Ireland, and I think that is a very important stronghold that we should cherish because every breed is not made the plaything of amateur breeders—the people who originate and try to carry out all sorts of ideas which are not sound. One breed may be taken and made to suffer with all the others in the background in reserve, so that even if one or more breeds were destroyed we would still retain the great fountain head to draw upon, to bring forward probably a breed of cattle that you in this country never heard of, that would serve your purpose quite as well as one more widely known. There are two ways of so-called improvement in breeding. There is first Bakewell's way of selecting the best and breeding those together and inbreeding until intensity of character is got which can be transmitted by mating the progeny with inferior specimens within the breed. There is a second way of breeding, i. e., taking those so-called improved specimens from one breed and crossing them on another. In the United Kingdom the breeds that are best known to you, and probably the public generally, have been improved by this second method of mating inbred male animals of very distinct types with females of the breed to be improved to attain a definite object, viz, a very fine animal possessing early maturity and better form, while you retain the general features of the original females.

You Americans have been, in an indirect way, partly the means of bringing to the front a number of local, distinct breeds, because you will not buy—and in this you are the same as the Argentines and other foreign buyers—beasts that have not a pedigree. This has made it necessary for local breeders to institute flock books, studbooks, and herdbooks, so that they may register their animals and thereby gain a share of the big prizes that are being offered for pedigree beasts across the waters.

The Shorthorn breed of cattle is the one breed which has been more experimented with in the line of mistaken breeding than almost any breed I could mention. It has had a wonderful constitution, however, for it has withstood much of the injury in a way that very few other breeds would have done. We have had the time of the Booth and the Bates cattle; we have now the time of the Scotch Shorthorn. But let me tell you that there is in England a breed of milking Shorthorns that have no pedigree, a class of cattle that I think for milking purposes is not surpassed, if it is equaled, in any part of the world. We have this great reserve in the Shorthorn breed of cattle to fall back upon, and I think it can be adjusted somehow that these beasts can be brought forward and made to occupy their proper place in the animal economy in our country as well as in all countries interested in Shorthorns. They have no pedigree. We know they are purebred: we know that the people who kept them and bred them have had a useful purpose, a utility purpose in view, namely, milk production and not the speculative idea of selling sires at high prices to go abroad.

As to sheep: The Lincoln sheep are the ones that have come prominently before the public in England because the Argentines, in recent times, have decided that these are the animals they want to breed from, largely because of the superior quantity and quality of Lincoln wool; but the Argentine has to produce mutton if he is going to gain the position in the British market he desires. He can not produce mutton of good enough quality to hold the market, if he breeds from the Lincoln. There is one breed particularly which you have not heard much of, the Ryeland, a fine-wool breed, and especially fine in the quality of the mutton. There is another breed, a local breed, called "Limestone sheep," the ewes of which have the peculiar quality of coming in season at a very early period. They are not in season all the time, but they come in season much earlier than the ordinary breeds and therefore are capable of producing early lambs for the market when the price of lamb is high. There are quite a number of mountain breeds, and in dealing with them the amateur breeder is pulled up at once. There has been no spoiling of these breeds by inbreeding. Nature also put her foot down, and would allow no introduction of alien blood, because lowland animals that were brought up to the mountains could not stand the climate and soon died out, and therefore we have in the background—you have not seen them at all—a number of mountain breeds which in certain districts of the country may be of value in crossing for the improvement of some of the breeds of this country.

Speaking of sheep, there is one point I must mention that must be known to all of you. The sheep population of the whole world, I think, with the one exception of Scotland, has decreased very much lately. There are many reasons for this. One is the cheap beef that is produced in America. Our people like beef better than they do mutton. The result is that in my country within the last thirty years beef-eating has increased enormously. Thirty years ago there was twice as much mutton eaten as beef; now there is twice as much beef eaten as mutton. But it is not merely a matter of the taste for mutton, the price of wool had no doubt something to do with it. I found in Argentina and Uruguay that the flocks of those countries suffered seriously from lombris, a parasitic disease. The stomach wireworm, *Strongylus contortus*, was the most serious cause of it. In Uruguay the whole sheep population died in one year mainly from the attacks of this parasite. In our country I think we suffer less from parasites than in most other countries, because we have subdivided farms and sheep are kept on small areas that are clean, from the stock being frequently changed. I know the difficulties in this country, but I think they too may be overcome. I anticipate that the decrease in the numbers of sheep here will not go on so rapidly in the future as it has done in the past. The rise in the price of wool will surely lead to an increase in the numbers of sheep.

Before closing I must mention some experiments conducted by one of my colleagues in the university in breeding zebras. My colleague, Prof. Cossar Ewart, conducted, at Penicuick, interesting telegony experiments which upset some important previous notions, even the notions of Darwin. You know it was once a common belief that the influence of the first male by which a female conceived was to be noticed in the progeny by different sires. Breeders of dogs of all sorts believed this and breeders of horses and other farm animals also believed it. One of the chief arguments in favor of the idea advanced by Darwin was the case of Lord Morton's famous Arab mare which first conceived to a quagga and then bore a colt, which had band markings on its limbs and withers. We have discovered since that Norwegian horses, and quite a number of our own horses, certain breeds of Arabian horses especially, have these bands quite often, so that it was only a coincidence that the animal in question had bands. The Penicuick experiments give no positive evidence, because they were not conducted long enough and were not numerous enough, but all the evidence advanced of a negative character goes to show that there is no influence whatever exercised by the first male on later progeny, and this ancient belief has been entirely given up in scientific circles. There is one point, however, that has been noticed, namely, the influence of imagination on the female bearing young. I have doubts on the subject but I have not been able to renounce the dictum. There is evidence so strong that there is something in the influence of imagination, which is yet to be explained, that we have not yet been able to give up this old and rather curious notion, which I suppose prevails on this side as well as on ours.

One point in regard to wild horses before I close. We have got a number of specimens of the Prejvalskie breed from the Gobi desert—right in the center of Asia. These are truly wild horses, although they possess some of the characteristics of the jack. The tail, for example, sheds the hair of the upper part every season, which the tail of the domestic horse does not do. Its feet are shaped somewhat like those of the ordinary jack, rather elongated. The hindquarters are shaped like those of the ass, and in a number of other respects the animal has asinine characteristics; but it appears like the horse in every other respect, and I think that by judicious crossing we shall be able to introduce some features into our breeds of horses from this wild origin that may be of value.

Now, one word with regard to the two great work horses of our country, the Shire horse of England and the Clydesdale horse of Scotland. In my view, these are one and the same breed. There took place in olden times a great many cases of crossing between the two breeds, and I think we have made a great mistake in not uniting them for the benefit of our foreign purchasers. I am sure that if the two societies would take the lead in this matter and open the stud books to both classes of animals and discourage the breeding of white feet and legs we might do a larger foreign business than we have done in the past to the mutual advantage of sellers and purchasers.

RESOLUTION OF THANKS TO SENATOR NELSON.

The committee appointed to draft this resolution reported as follows:

Resolved, That the Association of American Agricultural Colleges and Experiment Stations in annual convention assembled desires to express in formal manner its profound appreciation of the services of the Hon. Knute Nelson, of Minnesota, in securing from Congress a substantial increase of the Federal appropriations to our institutions.

Senator Nelson's initiative and persistent endeavors in this connection were largely responsible for its success, and it is the sense of this association that this formal resolution of gratitude be entered upon its records and a copy of the same be transmitted to Senator Nelson by the secretary of the association.

W. A. HENRY.
H. SNYDER.
W. E. STONE.

The resolution was adopted.

INSTITUTE OF ANIMAL NUTRITION AT PENNSYLVANIA STATE COLLEGE.

H. J. Waters, of Missouri, presented the following resolution:

Resolved, That this association sees in the establishment by the Pennsylvania State College of an institute of animal nutrition as an independent department of research a most important step in the promotion of scientific investigation in the interest of agriculture;

Resolved, That the executive committee be instructed to consider plans for providing permanent and adequate financial support for this enterprise and to take such steps toward the carrying into effect of these plans as the committee may deem advisable.

The resolution was adopted.

FORESTRY WORK BY THE COLLEGES AND STATIONS.

S. B. Green, of Minnesota, spoke in advocacy of the extension of forestry work, expressing the belief that every agricultural institution in this country should have a first-class department of forestry. He stated that the revenue from the forest reserves, which will amount this year to something over $1,000,000, goes, and has gone for several years, to the Forest Service of the United States Department of Agriculture, nursing that department into a strong, healthful life. He suggested that this income from the forest reserves, having been expended in bringing into life a great national department of forestry, may now be properly used to develop strong centers of forest interest in the individual States. He thought a large appropriation could be spent beneficially in every State and Territory for this purpose, and that proper effort to secure such appropriation from Congress would have strong support.

G. E. Fellows, of Maine, referred briefly to the work of the chair of forestry of the University of Maine, and favored bringing before Congress the matter of asking for an appropriation for forestry work at the land-grant institutions out of the income from the forest reserves.

E. Davenport, of Illinois, urged that the State legislatures as well as Congress be appealed to in such matters, that the States may be made to realize and assume their full responsibility in support of these institutions and enterprises.

ENLARGEMENT OF EXPERIMENT STATION RECORD.

J. G. Lipman, of New Jersey, suggested that the association take some action with a view to aiding in enlarging the scope and increasing the usefulness of the Experiment Station Record, more especially with regard to securing fuller abstracts of foreign investigations. He thought it would be desirable, perhaps, to divide the Record up into sections, one presenting abstracts of American, and the other of foreign, publications, the latter to be abstracted more fully than they are now.

H. C. White, of Georgia, spoke of the efforts which had been made to secure Congressional aid to enable the editor of the Experiment Station Record to enlarge its scope.

A. C. True, of Washington, D. C., stated that it was simply a question of money, and that he thought the Office of Experiment Stations was doing all that reasonably could be expected from it with the support it had. It was realized that full justice was not being done to the foreign literature, but that thus far the volume of literature had grown faster than the funds with which to do the abstracting. The effort had been, therefore, to keep up the comprehensive character of the Record, and do as much as possible toward giving some information regarding all literature that might be properly called to the attention of workers in agricultural lines in this country. The abstracting of foreign material, however, was necessarily a relatively slow process, and to do it in any adequate way would require a considerable addition to the present editorial force.

Officers of Sections and Members of Executive Committee.

H. C. Price, of Ohio, reported for the college section as follows: For chairman, R. W. Stimson, of Connecticut; secretary, E. R. Nichols, of Kansas; members of executive committee, H. C. White, of Georgia; J. L. Snyder, of Michigan, and W. E. Stone, of Indiana.

The nominations were confirmed.

M. A. Scovell, of Kentucky, presented the following as the nominees of the station section for officers for the next year: Chairman, C. E. Thorne, of Ohio; secretary, P. H. Rolfs, of Florida; members of executive committee, W. H. Jordan, of New York; C. F. Curtiss, of Iowa. The principal subject named for discussion at the next meeting was "Milk Production." (See also p. 110.)

The report was adopted and the nominees confirmed.

Members of Standing Committees.

The president named the following members of standing committees to fill the three-year vacancies:

Committee on instruction in agriculture: H. T. French, of Idaho, and H. C. White, of Georgia.

Committee on graduate study: M. H. Buckham, of Vermont, and R. H. Jesse, of Missouri.

Committee on extension work: W. C. Latta, of Indiana, and C. F. Curtiss, of Iowa.

Committee on experiment station organization and policy: H. J. Wheeler, of Rhode Island, and E. B. Voorhees, of New Jersey.

Annual Dues.

The dues for the coming year for each college and station were fixed at $15.

Canadian Delegates.

G. C. Creelman, of Ontario, thanked the association on behalf of the Canadian institutions for the privilege of the floor, and expressed the hope that those institutions would freely exercise the privilege and attend the association meetings in future years.

ELECTION OF OFFICERS.

On motion of W. E. Stone, of Indiana, J. L. Snyder, of Michigan, was elected president of the association for the ensuing year. The following vice-presidents were nominated and elected: First, E. A. Burnett, of Nebraska; second, H. H. Harrington, of Texas; third, E. A. Bryan, of Washington; fourth, C. D. Woods, of Maine; fifth, H. C. Price, of Ohio. For secretary and treasurer, J. L. Hills, of Vermont, was nominated and elected. A. C. True, of Washington, D. C., was elected bibliographer.

The session, at 12.30 o'clock p. m., adjourned to meet at 9 o'clock a. m., Thursday, May 30, 1907.

MORNING SESSION, THURSDAY, MAY 30, 1907.

The general session of the association was called to order, at 9 o'clock a. m., by President L. H. Bailey, of New York, in the assembly tent of the Michigan Agricultural College.

The PRESIDENT. The Association of American Agricultural Colleges and Experiment Stations considers itself fortunate to have the privilege of meeting in this tent on the occasion of the celebration of the fiftieth anniversary of the opening of the Michigan State Agricultural College. The association congratulates the college on its history and the influence that it has exerted on American agriculture, and it wishes to take part in this celebration for the purpose of expressing its appreciation of the work that has been done by this and other institutions of its kind. It is now fifty years since education by means of agriculture and the daily life was finally established as a part of our public educational systems. It came very largely as a revolt from the older type of education, which did not seem to have definite relation to the affairs and necessities of life. The institutions that first came into prominence in furtherance of this point of view were separate and isolated, expressing essentially a protest against the older type of education. For many years their work remained isolated and detached. Latterly, we have come to know that agricultural education is not by right an isolated agency or force; it is not class education, but it should relate itself to educational enterprises of whatever kind. Inasmuch as it has to do with the assembling in a pedagogical form of those forces that are related to the daily living, it is thereby a fundamental educational agency. It is very gratifying to the association to have the privilege this morning of expressing this idea by introducing to this audience the person who represents the governmental function in education in the United States. I have the pleasure and the honor of introducing Dr. Elmer Ellsworth Brown, United States Commissioner of Education, who will speak to us on "The Development of Agricultural Education," thereby relating it to educational agencies in general.

Doctor Brown spoke as follows:

DEVELOPMENT OF AGRICULTURAL EDUCATION.

The pioneer farmers of America had a double interest in life. First and foremost, they were pioneers, with all of the dangers and excitements of that pioneer life. Secondarily, they were farmers. It was hard and rude and unskillful, the farming in which they were engaged, but it gave them the necessities of life. When the first dull opposition of nature was overcome, when cabins had been built and woodlands cleared and the plow had in some way done its first work, the soil showed itself responsive and fertile enough. For a time, at least, life was easier. But the zest of pioneering was gone, and the more adventurous of our people soon moved on to the West, where they might feel the thin edge of civilization still cutting its earliest way through raw nature and barbarism, and know that that keen edge was their own life and endeavor. The farmers who remained behind were now farmers only, and no longer pioneers. They saw the first rank fertility of the soil fall back into more moderate bounds. Their life became tame and binding. New wants arose with the rise of new social relations. A few in every community were able, by insight and energy, to keep still in the forefront of things in that new age, but for many the occupation which made up the greater part of their life had become an unpromising, uninspiring, unenlightened servitude. In this jubilee, to-day, we are to recall the ways in which new zest has been brought into the depressed life of the American farmer, the ways in which his farm has been made part of a new frontier and he has been made once more a pioneer.

At first the improvement of our husbandry was the work of a few men, and these were men whose interest in farming was, in large part, a public interest. George Washington was one of the earliest and one of the most influential of these. First in war and first in peace, he was also, it would seem, the first American farmer of his day. His outlook over the educational needs of the new nation included proposals for the establishment of boards of agriculture, a military academy, and a national university. Other statesmen with a care for agriculture, and other farmers who were statesmen in their view, urged that practical provision be made for the collection and dissemination of agricultural information. In the opinion of these men it was information that was chiefly needed—information regarding the experience and experiments of those who were already most advanced in the practice of agriculture. The new awakening in European agriculture had great influence among the leaders of American agriculture at this time.

It was while we were still under the Articles of Confederation that a beginning was made in the formation of agricultural societies. Pennsylvania and South Carolina had established such societies before the adoption of the Constitution. New York, Massachusetts, and Connecticut followed during Washington's Administration. The publications of these societies had begun to appear before the close of the eighteenth century, and agricultural fairs came into being in the first decades of the nineteenth century. Various endeavors to secure the establishment of a national board of agriculture had led, before the day that we here celebrate, to the first seed distributions through the National Patent Office, and to the first separate agricultural appropriation in 1854.

Through these several movements, supplemented by a comparatively early development of an agricultural periodical literature, and through many later developments of agricultural organization, the growth of interest in the improvement of rural conditions has long been actively fostered. But our attention to-day must be centered upon the development of organized agricultural education, and to that subject we will turn without further delay.

Let us first note some bearings of agricultural education which have often been discussed, but must be considered here again in the interest of true educational perspective. Historically it has been found extremely difficult to bring the subject of agriculture into any manageable pedagogic form. The fact that everybody in the country knows something about it is at first a hindrance rather than a help. It is difficult to treat the subject in such manner as to avoid, on the one hand an excess of platitude, a repetition of what everyone knows or thinks he knows, and on the other hand an excess of unutilized natural science, deeply interesting in itself but hard to apply on the farm. Certain other subjects, of which education itself is one, share in this handicap. It is a difficulty met with in European schools of agriculture, and it had not been overcome in Europe or America when the Michigan State Agricultural College came into being. The most effective training for manual occupations was still some form of apprenticeship, apart from schools, while the school had long held the foremost place in preparation for literary pursuits. How to combine in one educative process the advantages of the school and the advantages of the apprentice system was the problem of agricultural education. In one form or another it has been the problem of all our education for special occupations in the past half century. For the student of educational history, then, this problem of agricultural education appears as one phase, and a peculiarly difficult phase, of the larger problem of training for any particular vocation in life. You will not look to me to contribute anything to the special history of this institution which others, here on the ground, may be expected to treat so much more effectively than I could treat it. But my theme deals rather with that broader movement of which the notable history of this institution forms a part.

It would be difficult to say just where and how systematic instruction in the principles of agriculture took its rise in this country. Such instruction was given in some sort in Moor's Indian School, out of which Dartmouth College arose, back even in colonial days. Benjamin Franklin proposed such instruction for the academy at Philadelphia, the forerunner of the University of Pennsylvania, but it does not appear that this part of his plan was realized. In the twenties and thirties of the nineteenth century great interest was excited in the so-called manual labor schools. It was proposed that a farm be attached to the school and that those who were studying during a part of the day should engage in ordinary farm labor during another part of the day. The purpose, to be sure, was primarily to provide a way by which students might "pay their way" through school. But there was a thought, too, of instruction in the better methods of farming, and at least a vague dream of something better yet, the vital union of thought and manual toil. Some of the old line colleges showed at least good will toward the scientific aspects of agriculture, Columbia even establishing a professorship under which agriculture was ranged alongside of other sciences. Then just at the middle of the century the State of Michigan provided in its constitution of 1850 for the establishment of an agricultural school, and seven years later this institution. the first of its kind and grade in the United States, was ready to enroll its first students. Pennsylvania had already incorporated its Farmers' High School. but it was preceded by two years in the actual opening by this State Agricultural College of Michigan. A little later in that same notable year, 1857, Justin S. Morrill, of Vermont, first introduced his measure for the endowment of agricultural and mechanical colleges in the several States by the National Government.

What is especially worthy of note at this point is the fact that this movement, which was primarily a movement of the people, or rather of the leaders of the people, found parallel embodiment in both State and National legislation. At first both the States and the Nation moved but slowly and tentatively. But within a few years large beginnings had been made. In this, as in other public interests, within the broad limitations of the National Constitution, working adjustments of State and National agencies to each other have been made from time to time in view of practical needs rather than of academic theories.

The great epoch-making act of this whole movement was undoubtedly the Morrill Act, which finally reached its passage when civil war had lent new power to the spirit of nationality in the National Legislature. In signing this act, on the 2d day of July, 1862, Abraham Lincoln, that "new birth of our new soil," that surveyor of western lands, who was to drive the labor of slaves from our American fields, now joined his work with that of Washington, to make our American tillage the doing of men made free by knowledge and enlightened skill.

By the Morrill Act of 1862 the National Government gave aid to the States in the way of liberal grants of lands; it encouraged the States to do in their own several ways the work of higher education in the domain of agriculture and the mechanic arts. While technical studies were brought to the front in this act, it refused to draw a line of opposition between those technical subjects and the training which makes for liberal culture. And both technical and liberal training were joined with preparation for the defense of the Nation's life.

Other important acts soon followed: That establishing a National Department of Agriculture in 1862, which Department was raised to Cabinet rank in 1889, and that establishing a Department of Education in 1867, which department was reduced to the rank of a bureau in 1869. In their different ways these two Government offices have both had to do with the administration of the later acts for agricultural education, and I think I may add that on their effective cooperation depends the full realization in the future of the high purposes for which those acts were passed.

After the civil war the establishment of agricultural colleges went steadily forward till such institutions, aided by the land grants of the General Government, had been erected in all of the States. with eventually 16 schools for colored students added in the Southern States. The association of these colleges was organized. the Hatch acts brought new aid from the General Government for the maintenance of experiment stations, the second Morrill Act added its large Federal appropriations for the furtherance of the ordinary work of the colleges. the summer graduate school was organized, the Adams Act provided for advanced research in agriculture, and. finally, the Nelson amendment to the agricultural appropriation bill of 1907 has brought still larger financial support to the colleges, together with permissive provision for the use of a part of the Federal grant in the training of teachers of agriculture. It is a record of notable advance, and we can hardly doubt that the great heart of Washington would have been glad to see the results that we may see to-day.

When we attempt to interpret the course of this educational development and to plan for further advance, we need the help of some general conceptions relating to our social organization. For it is evident that agricultural education can not be a thing apart and alone. Its real and lasting strength is to be found in its connection with general education. And the strength of general education and of all of its special developments is to be found in the connection of the schools with the real life of our people.

Passing over all other views of our democracy, however essential and interesting they may be, permit me to call attention just now to the function of those who are called leaders in a democratic society. For we now commonly recognize the fact that democracy does not dispense with leaders, but rather makes the strongest demand for positive leadership. But in such a society it is not for one individual or one class simply to lead, while another class simply follows. The true leader in a democracy is one who, while leading in all reality, is capable of learning from his followers. And the followers of such a leader in a true democracy are not those who follow because they do not think, but those who follow because they think and are able to recognize their leader. They follow because they are convinced. So our whole social fabric is made up of leaders who must learn if they would continue to lead, and their peculiarly restless and skittish constituencies. Here, as everywhere, the relation of leaders to constituencies is permanent and essential; but within that permanent relationship there is continual interplay and shifting of parts. It is a normal condition with us that those who have the subordinate part should be increasingly intelligent, critical, and ready to assume the actual leadership.

This is the state of things that our system of education fosters and must continue to foster. It must bring forth scientific experts who shall be able to teach the people the principles underlying the arts of life, and it must train up a people to make for the expert an intelligent constituency, quick to seize on all that he may offer for the betterment of their practice and quick to reject those suggestions that they can not put to use. So our public health rests upon the cooperation of highly trained experts in medicine and sanitation and a people who can act intelligently upon their directions and regulations. So our public and domestic architecture is improving slowly—very slowly—through the cooperation of architects who know their art and a building people who know their architects and who follow them in part and frustrate them in part. So, too, our agricultural education must proceed. There must be training of the highest sort for our agricultural experts. More than that, at the topmost reach of our agricultural education there must be that which is not commonly recognized as education at all, the pure research of the pure scientist. For no education can continue to be really alive unless it draws directly from some source of new and abounding knowledge a fresh supply never yet handled and made common among mankind. It may be very little that any year or any age may have to give that is altogether new, but that little will sweeten all the rest. Then our system of education must reach down to schools of the lowest grade, the little country schools, in which the capable constituency of the great experts is to be trained; and there, too, some of the future leaders are to make their first beginnings. The most of those in such schools are to live by the practical art of farming. But in these days they are to have the skill to take the science of the scientist and transform it into the art of their lives. They are to read agricultural bulletins and understand and use them. They are to pick their way and keep from being mired in the mass of such literature now provided for their reading. They are to attend institutes and conventions, where they will listen with discrimination to long and learned papers and make short and pertinent speeches of their own. They are to find the farm interesting in the highest degree, not only because of new hopes of profitable production which it offers, but also because of its connection with the great world of ideas.

When we grow more skillful, we shall make elementary schools of a better rounded type, in which the book learning that has long been the distinctive province of the school shall join to itself the best things in the old system of apprenticeship, and from that combination shall arise something better than either one in its lonesome isolation. Already we are beginning to make institutions somewhat of this order, and it will be done much better as time goes on.

This, then, is what we may see as the ideal in agricultural education and equally in education of other kinds, and perhaps of every kind: A system of schools complete in its sequence from the lowest to the highest, in which the study of books is closely joined with training for some of the practical arts of life; in which all practical training is kept in vital touch with general education; in which the ability to form sound and stable judgments is sought throughout, as a thing of very great price; in which the higher schools send into the lower schools an unbroken succession of teachers who both know the truth and are able to bring others to a knowledge of the truth; and in which, finally, the stream of knowledge fresh and new, from some department of pure research, shall never fail to keep fresh and bright the old wisdom of the ages gone before. Or, in more concrete statement, our elementary schools and high schools in country communities are still to be primarily schools of general education, but with much more of training in the arts of the farm, and the sciences lying near to those arts; our State colleges of agriculture and mechanic arts are to prepare young men and young women to read intelligently the literature of scientific agriculture, to form independent judgments in agricultural matters, and to bring their new knowledge into connection with the real work of the farm; these State colleges, moreover, are to provide well-trained teachers of agriculture and related subjects for the elementary and secondary schools; the colleges of agriculture, still further, are to be cooperative educational institutions and not merely special and local institutions—they are to cooperate with similar institutions in other States in order that the work of one may be strengthened by the work of all and cooperate with the universities of their several States for the innumerable advantages to both which may come from such united effort. The National Department of Agriculture is undoubtedly to continue its remarkably wide and influential work, its expert investigations, the issuance of manifold and vastly useful publications, and its furtherance of all manner of agricultural education and research in the several States. Finally, the Bureau of Education is to do as thoroughly as possible the part of this work assigned to it. I venture the hope that with enlarged resources it may do more than it is now expected to do, and that without trespassing on the proper field of other institutions.

Let me speak a little more particularly of the part of this programme which falls to the education office of the General Government. It can do its best work I think as a coordinating influence. It can bring to the notice of the less favored institutions information concerning the experience of more advanced institutions. It can call attention from time to time to the relation of agricultural education to general education. It can survey the educational field and possibly point out dangers to be averted or weak places to be strengthened. It can, finally, discover things that need the doing and are not attended to by any other agency, and can see that some part of such lack is supplied. So much as this I hope the Bureau of Education may be able to do for our agricultural education. And so much as this, I may say, it will undertake to do as far as its resources will permit.

Just at this time a survey of the field seems to show that the paramount need is the need of a supply of qualified teachers. Arrangements have already been made for the publication in the fall of an issue of the bulletin of the Bureau of Education devoted to the present condition of the agricultural and mechanical colleges and particularly to the ways by which teachers may be trained in those colleges to meet the needs of high schools and normal schools in which agricultural subjects are taught. A preliminary account of the history and present condition of agricultural education throughout the world is to appear in the near future in another issue of the bulletin, which will, it is hoped, be of assistance in such training of teachers and a help to those teachers who are already in the field.

In conclusion, the view can not be too strongly emphasized that all of this agricultural education is a contribution to the general education of the American people and to the betterment of American life. You who celebrate the fiftieth anniversary of this institution realize, as the history of this college has shown, that it is not simply larger crops and better breeds of stock and a more profitable output of farm manufactures for which you are laboring, but through these means and through all other interests of the modern farm you are working for the improvement of American citizenship, and that with especial reference to the needs of this great State of Michigan. May you long continue to serve the Commonwealth and the larger Republic as faithfully and as successfully and may every good cause in this land feel the reinforcement of a wholesome and vigorous life in the homes of our country communities, which have been made more prosperous homes and better homes because of the work that you are doing here.

The PRESIDENT. It is a great gratification to all of us who are interested in education in its broader phases to hear the Commissioner of Education say that the work of the agricultural and mechanical colleges is a contribution to education and to the welfare of the American people and the efficiency of American life; and also to hear him say that this great system of land-grant colleges is to be a part of a great cooperative and associative volunteer system of American education, expressing the idea that discipline and culture are not abstractions, but that they are the result of concrete work in special subjects.

The Commissioner has spoken of the influence of Washington as a farmer and of some of his ideals for institutions and organizations. It may interest you to know that Washington was one of the best farmers of his time, and to know also that his letters on farming, which were published a few years after his death, give us the best knowledge that we have of the agriculture of that day. It may be interesting to survey some of the things about agriculture that Washington did not know. Washington had never heard of a commercial forcing house; he had never known a wire fence; he had never seen an improved tomato; he had never known of canned fruits or canned vegetables; he did not know carbohydrates or potassium or agronomy; the word forestry was unknown in his day. In fact, in the later years of his life, he said that there had been some speculation that the food of plants was derived from an "accid," but that it was quite beyond his power to understand, and he would leave it for others. He did not know the full life history of an insect; he was not concerned with "pure food" agitation; he had probably never heard about speculation in wheat; he had never heard about a dehorned cow, or "clean milk," or a "nutritive ratio." Yet, Washington was mightily interested in agricultural affairs, and especially in agricultural organization. He would have established at the Federal city—he did not call Washington by the name by which we know it now—some kind of a national exchange organization or bureau whereby information concerning agriculture could be assembled and thence disseminated to all the people. The dream was finally fulfilled when, in the Administration of Grover Cleveland, the National Department of Agriculture was elevated to an Executive Department of Government and represented in the President's Cabinet. Washington never knew an agricultural school or an agricultural experiment station; yet he felt that it was important to assemble agricultural interests in some way whereby they could be made the means of training or aiding men. Washington did not know a locomotive; he had never seen a steamboat; he knew nothing about the telegraph; he knew nothing about electricity except as a mysterious force which in some way could be entrapped from the clouds by wires. He had never known a kerosene lamp; I suppose he had never heard of mechanic arts. All these great industries which have meant so much to the civilization of our times, in transportation, commerce, engineering, and mechanical arts have arisen within the past century.

I am convinced that we are sometimes inclined to overemphasize the agricultural phase of the work of land-grant colleges. We must remember that the purpose of the land-grant act was to educate men in terms of their daily lives; and there are two great means or agencies of accomplishing this end—by "agriculture" and by "mechanic arts." These are coordinate, one not more important than the other; both fundamentally important because they have to do with the very livelihood of the people and with the common things of the common day. It is not fundamentally important that we train men to be good farmers so much as it is that we train men by means of farming to be good citizens; not so fundamentally important to train good engineers as that we educate men by means of engineering and mechanical affairs. It is, therefore, very appropriate that in this fiftieth anniversary celebration, in which this national association joins, we should give attention to a discussion of the development of the engineering phase of education in the land-grant colleges; and I have the pleasure and the honor of introducing Dr. W. E. Stone, the president of Purdue University, who will present that phase of the question.

THE DEVELOPMENT OF ENGINEERING EDUCATION IN THE LAND-GRANT COLLEGES.

It is matter of conjecture as to how far Senator Morrill and his colleagues foresaw the great and true significance of the now famous act of Congress establishing the land-grant colleges. That it was to become the actuating force in a new educational movement, and that it was to influence the industrial and commercial growth of the Nation, profoundly, were generalities in which its advocates undoubtedly believed without being able to conceive of the details of their operation. The rapidity with which these institutions have sprung into commanding positions, have overcome prejudiced opposition, and have won public confidence and respect must have been beyond the comprehension of these men, for never in the previous annals of education has anything of equal or similar character or extent been recorded.

But now after the passing of little more than a generation, he who would chronicle the manner and extent to which these land-grant colleges have developed in respect to the single department of engineering education finds himself—so extensive is the subject—dealing with the leading facts of the times in regard to education, applied science, and industrial and commercial progress.

The impulses set in motion by the passage of the Morrill Act have developed in a remarkably short time a new education; have achieved great popularity and influence; have appealed to the democracy; and have proved its inestimable value to the industries. As is well known, the act, while remarkably broad in its scope, specifically emphasizes two principal lines of educational effort, viz, in "agriculture and the mechanic arts," and, properly, these colleges have from the beginning, in accordance therewith, expended their energies mainly in these two industrial fields. My duty at this time is to set forth what has been accomplished by the land-grant colleges in the sphere of mechanic arts. In this discussion I shall broadly include all of those institutions receiving State or Federal support, in which engineering is taught, since with few exceptions the State universities and colleges engaged in engineering instruction are also beneficiaries of the Morrill Act.

It is worthy of note that in nearly every instance the demands upon these colleges for instruction in "mechanic arts," especially in the earlier days, have greatly exceeded those for "agriculture." The aggregate enrollment of students of collegiate grade in engineering courses in these institutions has been many times greater than in courses in agriculture. Frequently the representatives of agriculture have shown impatience at these conditions, ascribing the inequality of attendance in these departments to unfair discrimination on the part of the college management. The real causes, however, seem to lie elsewhere. Instruction in engineering was earlier and better organized as regards pedagogical form; the industries included under mechanic arts have had a better appreciation of the value of technical training; there has been and is a tendency among young people to regard agriculture unfavorably as compared with other pursuits; and, finally, the recent extraordinary developments in manufacturing, mining, and transportation have created a great demand for men trained in the mechanic arts, which no inducements in the field of agriculture could match. The rapid development of engineering education, therefore, has obeyed the influence of distinct public needs and demands to meet which has given college authorities no end of difficulty, and which, under these conditions, they certainly have had neither power nor desire to stimulate.

The conditions which have been less favorable to agricultural education are now happily disappearing, and there can be no doubt that the agricultural courses in the land-grant colleges are soon to become quite as popular, attractive, and effective as those in engineering—a situation which I am sure will be welcomed by everyone who desires to see these colleges fulfilling their original purpose to the highest possible degree.

In endeavoring to trace the development and present status of these engineering schools one is soon impressed with the fact that he is dealing with practically the whole history of engineering instruction in America, and next he realizes that this record constitutes an important part of the world's progress in this field. In fact, in the essential development of engineering education the land-grant colleges, in their various forms of organization, have always been foremost and in the aggregate are to-day the principal exponents of this phase of education.

Systematic instruction in engineering science is a recent thing; it is a constituent part of the remarkable development of industrial and technological training which is recognized as the principal educational event of the last half century. It is true that some isolated and vague experiments in this field were undertaken nearly a hundred years ago, but an estimate of the scope and value of these efforts may be had by considering how imperfect was the existing knowledge of pure science until well into the nineteenth century, while the applications of these sciences to the arts and industries were scarcely recognized, much less organized into any pedagogical system until very recently. With two or three exceptions [a] there was in America no organized attempt at engineering instruction prior to the civil war. Contemporaneous with or following this period there came three epoch-making events, each of which was in itself of great importance, but which in conjunction have wrought an extraordinary national influence upon education and industry. These events were the establishment of the land-grant colleges, the great wave of scientific discovery and invention, and the remarkable commercial and industrial development of the country. Under these conditions the growth of engineering schools has been little less than remarkable.

In claiming thus for the land-grant colleges a considerable degree of prestige on account of the development of engineering education I am not unmindful of the great contributions to progress in this field made by other institutions. For this all due credit should be given. Nevertheless, if one could conceive of the annihilation of what has been done and is doing in the land-grant colleges in engineering science the loss would involve, I am sure, a very large part of the present possessions of engineering education in America if not of the entire world.

That this should be so is, after all, quite natural. If anything less had been achieved upon this special foundation and in the stimulating industrial atmosphere of America our institutions would be blameworthy indeed. The conditions have been unusually favorable and in general they have been utilized with marked success.

This development has been on characteristic and, in some respects, unique lines. Because these institutions were new foundations—for the most part—they were free to build new structures untrammeled by conventionalities and free from useless imitations. Just as our engineers are notable for their initiative, adaptability, and resourcefulness, so our enginering schools have met and solved their problems on the ground in a practical way. Without ignoring what was of value in previously existing systems, they have been free to strike out in new lines. Wisely, they have from the first endeavored to adapt their methods and scope of instruction to the distinct needs and conditions of our industries. This policy has evoked much sharp criticism as to its real educational value, but the schools have gone steadily on, creating a new education with a new spirit; winning the confidence of the commercial world; and becoming the chief bulwark against the growing prejudice toward "the college graduate." Recognizing that enginering is an intensely practical profession, they have sought to impart a training which should develop in their students the power to do things effectively, in the belief that this is the modern criterion of education. To these established characteristics of originality, adaptability, thoroughness, and efficiency our engineering schools undoubtedly owe their high standing, popularity, and the confidence of the professional and technical world.

Since these institutions, by reason of their origin and functions, form a class by themselves, it is important to classify and enumerate their features of organization, method, and curriculum which constitute the present basis of engineering education in this country.

The institutions are for the most part of collegiate grade, receiving students from the secondary schools and administering a full four years' course, upon the completion of which a variety of degrees of the bachelor's rank are conferred. With few exceptions the land-grant colleges are coeducational, and women students are occasionally found in the engineering courses. A few have been known to graduate, but of their subsequent careers the engineering chronicles are significantly silent.

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[a] Rensselaer Polytechnic Institute, founded in 1824; the Lawrence Scientific School, in 1846; and the Sheffield Scientific School, in 1847.

Measured by the conventional standards established by schools of liberal arts, the requirements for entrance are not high, varying in different parts of the country from six to sixteen high school units. In many instances these requirements are higher than for the agricultural school in the same institution. As a rule, in any given part of the country admission to the enginering school is practically on the same basis as to the college of liberal arts, although usually not identical. The authorities are agreed, for the most part, that in State institutions it is unwise to require preparation which the average public schools of the community can not supply.

Nor is it the practice to include Greek or Latin in these requirements. Weight is laid chiefly upon English, mathematics, and the sciences as being directly necessary to the work of the engineering courses. In other matters the engineering schools have not been bound by the practices of others, but in their entrance requirements have given consideration to the educational opportunities and needs of the industrial classes. On the other hand, they recognize elements of training and preparation which are quite ignored in the purely academic requirements for colleges of liberal arts. It may be claimed, consistenly, that entrance requirements to engineering schools should differ from, but not be of, lower grade than those of colleges of liberal arts. Every one knows that book knowledge alone does not give power and efficiency, and it would seem that in standardizing entrance requirements to engineering colleges some weight should be given to the maturity and experience of the applicant. In short, our engineering schools are coming to recognize that a valuable part of the preparation for an engineering course may be obtained in the field, shop, or office, and can not be measured in high school units alone.

The curriculum of our engineering schools is characterized by the weight given to mathematical, scientific, and technical subjects, in contradistinction to the classics and humanities, although in all of these there is an evident purpose to retain in the course of study as much as possible of the cultural elements. English, the modern languages, history, and economics are for this reason given much weight. The physical and chemical sciences, mathematics, shop practice, and drawing are the fundamentals of engineering education, and following these in sequence come the subjects of mechanics, machine design, thermodynamics, hydraulics, and the various specializations pertaining to the different branches of engineering practice. The student has little choice of subjects in any given course, for the elective system is unsuited to the mastery of a logical sequence of facts and principles. The curricula of engineering courses are therefore almost exclusively prescribed. There is, moreover, a characteristic blending of the theoretical and practical. A knowledge of the hypotheses and theories of pure science are fundamental to the training of an engineer, but they are valueless to him unless their applications are traced. Naturally the laboratory has a large place in this scheme of instruction. It is necessary that the student have contact with and an intimate knowledge of the machines and materials with which he is later to deal. The laboratory courses and equipment are therefore striking characteristics of our engineering schools. In chemistry, physics, electricity, steam engineering, shop practice, materials testing, hydraulics, and drawing each student must be supplied with a work place and equipment for the study of the actual phenomenon or object under consideration. The shops and laboratories of a modern engineering college have all of the aspects of a commercial establishment and contain types of the real machines and materials of commerce. These methods and equipments are responsible for the costliness of engineering education, in marked contrast to courses in liberal arts.

From the nature of the subjects taught, the standard of scholarship in our engineering schools is high. The predominance of mathematical subjects, the accuracy of observation and statement required, the analytical character of much of the work, render it impossible for a dull man to succeed. These schools are not training mechanics or skilled workmen. Manual dexterity is important and a knowledge of practical operations essential to the engineer, but his power lies in his capacity to organize and utilize forces and materials, and his training is intellectual rather than manual. The actual expenditure of mental effort required of the engineering student is, I believe, quite exceptional, for the successive steps of advancement to which he must attain are fixed and absolute; they involve the exercise of opinion and criticism but slightly; they require rather a definite knowledge of facts and their application which permits of no error or half knowledge. High standards must be maintained, for the graduate must ultimately sustain the most exacting tests in practical experience. Nothing would more speedily destroy the efficiency of engineering training than low standards of scholarship.

The scope of engineering instruction is as broad as the country itself. In all of the schools the general principles and fundamentals are taught, but beyond this is a wide variety of development into special lines related to sectional or local interests. Civil, mechanical, and electrical engineering are the subjects most commonly presented, but several institutions offer courses in mining engineering, while sanitary, municipal, and chemical engineering and architecture all have honorable place in the list. Certain institutions offer instruction also in engineering principles as specially applied to sugar making, irrigation, forestry, and textile industries; marine engineering is also taught in one or two schools, and there is an interesting and increasing development of engineering instruction as applied to farm machinery and operations, which is perhaps best designated as farm mechanics.

The extent of the courses of instruction in engineering is, in point of time, usually four years, of which the first two are spent upon the fundamental and general subjects and the last two upon those which are special and technical. Among other usual requirements for graduation is the completion of an original study or investigation, the results of which are presented in a "thesis." The graduate receives in most cases the degree of bachelor of science, which is frequently further qualified with reference to the particular line of study pursued. A few institutions give professional degrees, such as electrical engineer, civil engineer, etc., for the completion of undergraduate courses. The larger and better equipped colleges also administer graduate courses for which advanced degrees are granted. In a few instances the honorary degree of doctor of engineering has been given.

By no means a minor phase of the work of these institutions is that of research and investigation. Countless problems present themselves in connection with every industry, in regard to the improvement of methods, designing of apparatus, use of materials, fixing of standards, etc., and for information on these matters the public applies with confidence to the engineering schools. Scientific and technical literature teems with articles from teachers and students of engineering, and many of the contributions to knowledge from this source are of national or, indeed, world-wide fame.

Having thus briefly outlined the present methods and work of the engineering schools, I would broadly characterize their distinguishing features to be (1) an adaptation of instruction in theory and practice into a course of training which is at once of high educational value and of special application to practical affairs, and (2) the high efficiency in turning out a product which commends itself to practical men, and which is ready for immediate participation in the work of the world.

WHAT HAS BEEN ACCOMPLISHED.

The immediate products of these schools are thousands of young men trained in accurate, scientific methods of thought and study, skilled in the application of scientific principles to practical affairs, and grounded in the fundamental principles of engineering work. That there exists a great demand for young men of this type in all kinds of manufacturing and producing enterprises immediately makes clear to the individual that this kind of education is profitable because of the good market for his accomplishments; and not only is the immediate opportunity for the young graduate exceptionally good, but the way is open to a career of great responsibility, influence, and remuneration.

On the other hand, the value of these trained forces to the industrial and commercial interests of the country can not be overestimated. There could be no continuous development or progress without these trained men, and though the graduates of these schools are still young their influence upon methods, practice, and operation is already an important factor in our country's development.

A further result of this breeding of trained engineers is to educate the public to a better appreciation of the value of the application of scientific study and methods to all business and industrial operations. The development of this understanding is altogether significant. A few years since any young man who based an application for a business position on the fact that he was a college graduate would probably have been treated with contumely. Now all of this has been changed, and it is the ordinary experience of engineering schools that all of the members of their graduating classes are sought for professional positions before they have received their diplomas. This broader appreciation of the value of trained men and of the application of scientific methods means true progress in our industrial and commercial development. It means better public utilities, higher factors of safety and health, and cleaner, saner, and safer living for the whole people.

Still further, and quite aside from the professional and technical influence of the graduates of these schools, I regard it as not presumptuous to claim for them a citizenship of high quality. I claim that no other training is likely to breed so genuine a contempt for shams and hatred of dishonesty as the engineering training, and that no other class of men is so likely to stand for right principles in the administration of public offices as well as for private honor and honesty. Of course there will be exceptions to this rule, but if there is anything in dealing with the immutable laws of nature, anything in the engineer's conception of accuracy likely to develop respect for law and sincerity of purpose, then the training which the engineer receives can not but have its corresponding effect upon character.

Finally, among other results of the work of engineering schools, we may not ignore the actual contribution to technical and scientific knowledge made through investigations and researches carried on in the laboratories of their institutions. These investigations relate to every possible phase of the production and utilization of power, the performance of machines, and the characterization of the physical properties of materials of construction. To illustrate more fully what is meant by this statement I may point out that a generation ago it was the exception that any machine was constructed or purchased on a specification as to its efficiency of performance or for any material of construction to be supplied on a specification of qualities. Now the effort is to conduct all transactions upon a specification of quality or efficiency based upon accurate scientific tests. For instance, no one now buys a steam boiler except on specification of its evaporative efficiency, or steel except upon specification of its strength, or paint, or coal, or cement except upon certain guaranties of quality, and even the physical characteristics and qualities of timber are now being determined and fixed in engineering laboratories as a possible basis for future use in this way. The work of determining these standards for all machines and materials, of devising methods of testing, of accumulating the vast data of reference, and of actually carrying on these tests and determinations has been the contribution of our engineering laboratories. How vast this is and to what an extent it controls and improves engineering practice can be imagined but scarcely comprehended. In the great engineering societies engaged in promoting and fixing engineering standards the teachers and graduates of engineering colleges are prominent, and through these channels exercise their influence on professional practice. Another important contribution from the teachers of engineering has been the development and organization of the material of instruction. A generation since scarcely anything had been done toward systematizing engineering instruction, but during this time curricula have been perfected, texts written, laboratory experiments devised, and the entire plan of teaching brought to a high degree of efficiency.

These facts indicate that the work of the engineering schools of the land-grant colleges has been quite as extensive, valuable, and useful in its way as has ever been accomplished in any educational field in a like time. Indeed, in view of their rapid development and the extraordinary contemporary interest in technical affairs, probably no other schools have exerted so great an influence in so short a time.

WHAT IS TO BE THE FUTURE DEVELOPMENT OF OUR ENGINEERING SCHOOLS?

Up to this time engineering instruction as an organized force of education has been occupied with laying foundations, with systematizing and developing its teaching, with creating texts and lectures, and with the adaptation into teachable form of an enormous mass of material. It has been burdened with the demands for practical men. It has been called upon to solve problems, to supply men, and to meet the exacting demands of an unparalleled commercial and material development. Much of this work has necessarily been of an elementary character, because of the absence of any other agency to perform it. The requirements growing out of these conditions are now being fairly well met in the various engineering colleges. We shall probably next see a differentiation of this instructional work by which the elements of engineering and industrial training will be administered in industrial, trade, and manual training schools. In this way the opportunities for this kind of training will be greatly multiplied and made available to far greater numbers of students than at present, and the general effect of this upon the public will be vastly beneficial. The engineering schools will then be free to devote their resources to instruction and research in the higher branches of technology.

A logical step in this direction will be the establishment of bureaus or laboratories devoted entirely to investigations of engineering problems and the fixing of standards. I believe we shall come in this way to the engineering experiment station, the analogue of what has now become so important an adjunct of agricultural instruction, namely, the agricultural experiment station. Two States[a] have already established such research stations, with generous financial support. There can be no logical argument advanced for the agricultural experiment station which will not apply with equal force to the engineering station, be it on account of the important interests involved, the problems inviting solution, or the industrial value of such an institution.

In conclusion, one can not contemplate the developments of these institutions without a feeling of pride in their achievements and a conviction that the phase of education which they typify is destined to become more and more important in America. The essential basis and foundation of a nation's welfare is to be found in its industrial conditions. It is true that those abstract qualities which contribute to national greatness and patriotic citizenship are the offspring of ideals rather than of material things, but these can never come to their fullest fruitage without that substantial foundation afforded by rational and well-balanced industrial forces. The highest development of national ideals is like a flower whose beauty is unfolded in a clear atmosphere, while its roots find anchorage and nourishment in the fertile stratum of an intelligent industrial democracy. True industrial progress consists in utilizing with ever-increasing economy and accuracy natural forces and materials, in more scientific methods of operation and management, in securing better conditions of life for industrial workers, in furnishing products of better quality at lower cost, and in narrowing the gap between the employer and the employee. Education alone can accomplish these things, but it must be an education which reaches the industrial classes and applies to industrial conditions, and this is the true aim and spirit of our land-grant colleges.

The PRESIDENT. Many of us have wondered why the engineering phase of the land-grant college work has developed so much more rapidly than the agricultural phase. The last speaker has told us why it is, because there has been a living demand for that type of education, and also because that education has been definite and concrete; the problems have demanded extreme accuracy, and nearly all of them have had fair applicability to the affairs of life. It was an old idea that education in some way should be "adapted to" the needs of life. We now have taken a somewhat different point of view, feeling that education should develop out of the needs of life and be fundamentally native and indigenous. It is one thing merely to apply education; it is quite another to develop it out of the very affairs of life. This development has taken place notably in the case of engineering study, as President Stone has told us. These studies now are a part of the real affairs of life, and they are expressions of the activity of the commercial world. Ideals, as discipline and culture, are not abstractions, but ideals should develop out of the necessities of life. I fancy that this engineering and agricultural education is finally going to fertilize and vitalize all grades of education, particularly in the high schools.

None of this work, however, can be really effective and abiding unless it is founded on the acquisition of new knowledge. No man who teaches the same subjects year after year in the same way can be a good teacher. He must develop new truth on his own account—such person has a young mind, which always comes from the acquisition of new knowledge. It is most interesting historically that the earlier efforts looking toward industrial training desired to introduce some kind of research or investigation work. In fact, there were concrete expressions for experiment stations before there were similar expressions for real agricultural colleges. One of the first agricultural schools ever proposed was by Samuel Hartlib, an associate of John Milton. He proposed to send instructors to the four parts of the world, that they might there investigate, and a very significant phase of this recommendation was the provision that any person who had been teaching what was not true should thereafter publicly retract. Investigation stands for truth; it stands for no man's opinion. It is fortunate that we are to-day standing for real research work in agriculture and are founding our education on it. I have the pleasure of introducing one who embodies the research effort, Director W. H. Jordan, of New York Experiment Station, who will address us on the authority of science.

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[a] The University of Illinois established an engineering experiment station in 1903, and the Iowa Agricultural and Mechanical College in 1905.

THE AUTHORITY OF SCIENCE.

As a prologue to the subject that I have assigned myself, permit me to present to the officers and students of the institution, whose guests we are, my greetings and felicitations. This is indeed an occasion for well-deserved congratulation and praise. We are assembled within the borders of an institution that for fifty years has rendered distinguished service in a new field of education, and there are some features of this service which merit generous and grateful recognition.

To the trustees and faculty of this college I would say that it is a notable achievement to have taken a leading part in building new avenues along which knowledge has approached more closely to human needs, especially when to do this in the face of unbelief or of dogmatic opposition has rendered on your part a tenacious faith and an abiding courage. At the same time you and your predecessors have manifested a spirit of rational and safe conservatism. While your college has departed widely from the curricula of the older institutions, it has held fast to the great truth, the soundness of which can never be successfully assailed, that the only way to uplift any industry is to develop among those who are engaged in it not only technical knowledge and skill, but intellectual and moral force. To this end the vagaries and educational poverty of extreme specialization have not been allowed to seize upon your courses of study. Evidently you have not believed that "intensive knowledge" of one subject compensates for "extensive ignorance" of everything else. It is clear that you have not been willing to wholly subordinate to his vocational skill a man's intellectual and social well-being. This much of the faith and practice of the fathers has remained with you. May you never lose it.

I suspect that your wise conservatism has been due partly to the fact that you have had among your number great leaders and teachers who have been both expounders of truth and centers of inspiration. Two of these I came to know a quarter of a century ago, one of whom, ripe in years and full of honor, has entered into his rest. The other, with unabated zeal for truth and undiminished loyalty to your interests, is still your beloved associate. Evidence of the influence of these men and of the policy that they helped to sustain is seen in the remarkable number of the sons of this college who in all parts of the United States are occupying positions of honor in the field of agricultural science as teachers and investigators.

I congratulate you on the record of fifty years. As a fitting commemoration of the spirit and influence of your honored institution and as pointing to the true philosophy of all education, I would that in passing we might pause to erect a wayside altar and, in characters so bold that he who runs may read, leave on it this inscription: *What man is determines what man achieves.*

The suggestive title of a recent book written by a distinguished graduate of this college is The Outlook to Nature. This volume, that fifty years ago would not have been well understood, is symptomatic. It worthily expresses a trend of thought in education and in practical affairs that is one of the most noteworthy features of the present time. Man is just now very busy discovering himself and his relations to the physical world. He is studying and mastering his environment as never before. The rise of institutions of investigation, the crowded state of university and college courses in the sciences and their applications, university extension courses along popular scientific lines, the wide attention given to nature study, the many assemblages of farmers for the consideration of subjects semiscientific in their character, and, indeed, the knowledge applied to our whole economic progress, are convincing evidences that the outlook to Nature's methods is earnest and widespread.

The serious side of this world-wide movement is the conviction that science is a trustworthy guide in directing our activities. In all ages man has been prone to seek the guidance of authority. He listened in faith to the prophets, sought the counsel of the ancient oracles, accepted the dogmas of the church as arbitrating all truth, both temporal and spiritual, and has been the dupe of the necromancer and the fakir. But now we have turned to science, and, excepting in things spiritual, it utters the final word. To be sure, there are still those who scoff at the scientific man as unworthy of confidence, sometimes with good reason, but on the other hand many trust him overmuch and behave toward his utterances as though they are infallible. Comparatively few use knowledge in a discriminating way. Indeed, few are qualified to do so, for in this, as in many other weighty matters, the masses walk by faith, and not by sight. If, then, science is the oracle of to-day, what a grave responsibility attends its teachings. He who assumes to interpret Nature must reckon not only with truth, but with his fellow-man, whose welfare is to be safeguarded.

This is more than a fancied obligation. Science has come to be closely concerned with the large affairs of human life and activity. It lays its compelling hands upon nature's great forces, directs agriculture and the industries, designs machinery, builds bridges, protects health and prolongs life, feeds the intellect, is a theme for literature, and essays to invade the great mysteries of religion and the future life. Its conculsions guide our vocations, are the dicta of the class room, and are proclaimed as truth from the platform and pulpit.

How intimately, too, has science laid hold upon our individual lives. It has greatly increased our comforts and intensified our pleasures. Whether we travel abroad or abide at home we are the subjects of its beneficence. Indeed, it has also entered into our anxieties concerning our most serious relations. When we survey our morning meal we consider in terms of chemistry whether the repast is nutritively sufficient and what our chances are in a physiological contest with its germs and germicides. A glass of water on the railroad train is taken with proper scientific reservations as to our future prospects in the hands of the doctor and the nurse. The wisdom of the crucible and the microscope have even been invoked in the domain of our religious thought, sometimes to assure us concerning the verities of the Christian religion and sometimes to assuage our fears as to the certainties of divine retribution.

But what is science and from whence comes its authority? On what grounds may it rationally appeal to our confidence? Those of us who accept its verdicts as a part of our intellectual equipment, to whose activities truth is a blessing and error a disaster, whose personal and material well-being may be jeopardized by unsound conclusions, have a right to ask these questions and ask them insistently. I crave your indulgence while I attempt to answer them.

A concise definition of science is, "Knowledge amassed, severely tested, coordinated, and systematized, specially regarding those wide generalizations called the laws of nature;" or, more simply expressed, "Knowledge gained and verified by exact observation and correct thinking." The specifications, "Knowledge severely tested" and "Knowledge gained and verified by exact observation and correct thinking," clearly indicate not only what science is, but what it is not. It is not opinion; it is not platform speculation, however eloquent; it is not truth dilated or distorted by much repetition; it is not magazine exploitations of the new and wonderful in a way that fires the imagination but deceives the understanding; it is not theories partially supported by data; it is not dangerous conclusions vitiated by confessed errors or propped up on all sides by "ifs" and "provided;" it is not a "report of progress" that shows little more than what the investigator hopes some time to prove and will take up again when he has opportunity; true science is none of these things. Some of them may be steps in its direction, but they do not constitute "severely tested" or "verified" knowledge. So obvious a truth would scarcely need stating were it not for the fact that our scientific literature is submerged with increasing records of incomplete and inconclusive observations. It is a sobering thought that only a minor proportion of the mass of generalizations that are published endures severe scrutiny and becomes permanently incorporated into the body of science.

Scientific generalizations at their best are far from infallible. Every spot of truth is so surrounded by unpenetrated, and therefore unknown regions, that many conclusions are properly held to be tentative. Even some deductions, the result of researches apparently most exhaustive, that are stated without reservation or modification, are abandoned as larger knowledge is gained. A most striking example of this is furnished by the investigations as to the sources of nitrogen to the plant. In 1857–58 Lawes, Gilbert, and Pugh carried on at Rothamsted, England, what has been pointed to many times as a classical research on the question of the use by plants of the free nitrogen of the air. The inquiry was most severe. All available knowledge was brought to bear on it and the conclusion was reached that uncombined atmospheric nitrogen is not available plant food. This verdict is now reversed by later evidence of the soundest and most incontrovertible kind. In 1857 knowledge of the biological activities of the soil was very meager. The Rothamsted investigators worked with sterilized earth, not realizing that they were thus destroying the germ life which, as we now know, somehow functions in aiding the legumes to utilize atmospheric nitrogen. While the plants did not acquire free nitrogen under the conditions involved in the investigation, these conditions were made greatly unlike those prevailing in nature. Science will always be subject to such reversals. Its progress has been, and always will be, a series of advances and retrogressions, with the outposts of knowledge steadily advancing. All this but emphasizes the supreme importance of organizing inquiry on a thoroughgoing basis, coupled with a judicious conservatism in the formulation of conclusions.

If, then, what we call science is a mixture of truth and error, of the enduring and the transient, by what standards shall we measure its reliability? You will agree with me, I am sure, when I state that wise critics estimate the value of scientific deductions by their authorship. When new conclusions are brought to our attention our first inquiry is for the name of the author, and three factors enter into our judgment of him and consequently of his work. These factors are (1) his personal equipment for investigation; (2) his motives or point of view; and (3) his environment.

The primary consideration is the man. It is a fundamental fact which should receive greater emphasis that what is presented to us for truth takes form in the human mind, and the quality of what we are asked to believe bears a close relation to the development and equipment of the producing intellect. Unripe minds will inevitably produce unripe science, and while intellectual conquests are won of which we are proud and that bear ripened fruit, much so-called science is being forced upon our attention to-day that is as unripe and unassimilable as the proverbial green persimmon.

The man side of research is emphasized at this time because, in my judgment, it is not sufficiently considered in our development and support of the work of inquiry. This development must begin with the preparation of men properly fitted to conduct research that is worthy of the name, and until this is accomplished other means, such as money, buildings, and apparatus, are inefficiently and wastefully applied. Material equipment is subsidiary to the intellectual. The normal and only successful order of procedure in this, as in every other effort, is first an efficient instrument and then the means for utilizing it. Any other sequence is irrational and unsafe.

Again, an investigator in science should be judged by his controlling motives or point of view. It has been said, with what accuracy I do not know and shall not inquire, that an English university once wrote over its portals "No useful knowledge taught here." One of our own scientists is absurdly reported to have expressed a regret that chemistry was ever put to money-making uses. Those of us who are devotees of applied science repel such sentiments and, having right on our side, declare with great fervor that we will have nothing to do with knowledge that can not be brought into the service of humanity. We are glad that learning has escaped from the monastery into a throbbing, busy world. We have no sympathy, either, with the modern monastic spirit sometimes manifested by those who claim to be working in the field of what is designated as pure science and affect contempt for the utilitarian.

But on the other hand, it is time for us to give practical recognition to the fact that great victories never have been won in science, and never will be, when knowledge is sought merely that it may be weighed in the balance as bullion. The investigator whose foremost thought is financial advantage either to himself or to others has an inferior point of view and is devoid of the highest inspirations. I know that some good people of an ultra practical frame of mind take exception to the statement that the investigator should "seek truth for truth's sake" and declare that the controlling point of view should be that of utility. Granting that knowledge reaches its best estate when it serves human needs, it is still to be said that inquiry is not on safe ground unless the dominant impulse is to know the truth. The true scientific mind is the truth-loving, truth-seeking mind. He who possesses it is dominated by a desire for knowledge that leads him to sacrifice, if necessary, opportunities for power, distinction, wealth, or pleasure. In these days of money-making invention rather than of a desire for larger intellectual vision, when the imaginations of ambitious men are dazzled by the opportunities for financial gain, we need a renaissance of the spirit which inspired and upheld the fathers of science in the classic researches that have laid the foundations of modern knowledge. Until this comes in a greater measure than we now have it we may not reasonably hope for the solution of many of the great unsolved problems of agriculture.

In the third place, research efforts take color and value from the environment in which they are carried on. No investigator is likely to be immune to the influences that surround him, and there are modifying conditions the presence of which must be regarded as essential to the highest type of inquiry. If, as is obviously true, science is an individual product, the initiative and liberty of the individual should be safeguarded. The research worker must be allowed, within reasonable limits, to follow his inspirations and enthusiasms in his own way. Investigation that is too highly organized into a mechanical system so that duties are assigned as in the routine of an administrative department is infertile. It is a station worker's inspirations rather than his director's commands that are fruitful. Science that is worth anything will never be ground out by machinery however costly and elaborate the mechanism may be. Neither should the investigating mind be subject to the coercion of public sentiment or the demands of expediency. Its operation should be carefully guarded in an atmosphere of quiet and unbiased reflection. This should also be an atmosphere of deliberation and not of haste. New knowledge that is reliable is reached with exceeding slowness, for it is wrought out only by immense labor and with untiring patience. Perhaps what I have said concerning the authority of science may be summarized and made more specific by the statement that the knowledge most trustworthy is that which proceeds from the domain of conservative scholarship—such scholarship, if you please, as is bred in the atmosphere of our best colleges and universities. Despite the dangers from academic dogmatism, it is in such surroundings that we now generally find the most critical and impartial judgments and the most careful deliberation in the formulation of conclusions.

The conditions essential to effective inquiry have been briefly outlined at this time in order that they may be compared with those under which agricultural research is undertaken in the United States. But before such a comparison is made I would like to meet one thought that I suspect is already in your minds concerning what has been said. Doubtless your mental comment is that the specifications laid down are ideal and at present are unattainable by the institutions here represented. If this be true, then so much the worse for the prospects of scientific progress among us. When the temperature necessary for the hatching of eggs in an incubator is unattainable in a given instance, the eggs will not hatch. But I do not concede that there is anything extreme or impracticable in these specifications. They have existed, and they exist now in some places, and it is only where they are found that research is in its best estate. * * *

We are seeing with greater distinctness every year that the more complex and more important problems of agriculture are still unsolved, and that because of this our utterances to the practical man are still lame and halting. Do you doubt this statement and ask what these problems are? Who of us is able to stand on his feet and define fertility, or even demonstrate the relative value of its various factors? Do we not often quail before the simple and direct questions of the farmer when he seeks information as to the production of crops and sometimes return him answers bedecked with glittering generalities? We say much, and not too much, about the wonderful value of the legumes. Clover and alfalfa have been the most valuable asset of the institute speaker, and yet we are in profound ignorance as to how much nitrogen they take from the atmosphere when they are grown under the ordinary conditions of farm practice. Once we had the German standard rations for farm animals and our ex cathedra formulæ were convenient and much admired. Now we have practically lost these standards in the misty mazes of new data, and nutrition problems still harass our minds. Control of results in the breeding of plants and animals is still an unsolved riddle. (This statement should be made, I suppose, with an apology to the mathematical formulæ of the disciples of Mendel.) Tuberculosis in farm animals is an unconquered scourge. Do not say that there are no great agricultural problems left for us to attack. They are both great and many, and their successful study demands investigation of wide scope and masterful ability. We should not feel that because agricultural science deals with things common and familiar its problems are easy and may be solved by correspondingly easy methods. All that is required for progress in any other field of inquiry whatever in the way of efficiency of organization, scientific acumen, and severity of method is required here. It is greatly to be feared that our efforts at popularizing knowledge have also popularized our conceptions of what constitutes effective research.

In repeating the assertion that we have failed to grapple with the large problems of agricultural science, as has been our privilege and opportunity, do not understand me as disparaging the results of your efforts. You and your predecessors have been engaged for the past thirty years in a noble enterprise which you have loyally sustained. It is a common remark from those who come in contact with this body for the first time that it is made up of men of unusually earnest endeavor, who are evidently seeking most conscientiously to do the work that they have in hand, and those who have frequented these meetings for many years know that such a comment is entirely just. Much has been accomplished. It is generally conceded that no instance is on record where technical knowledge has been brought into such close and practical touch with the people as has been done for our agriculture during the past twenty-five years. The comprehensive organization of the effort and the sympathetic relation of the various agencies involved, from the university to the home reading course, are worthy of our admiration. The uplift of agricultural thought and practice has been great, and has abundantly justified the new democracy of education. I am convinced, nevertheless, that, as was inevitable under new and untried conditions, some serious mistakes have been made in our attempts at research. But just now we are assuredly on the verge of substantial gain in the purposes and methods of our work, and it may not be amiss to glance briefly at some of the conditions, not yet entirely removed, that are inimical to scientific efficiency and progress.

The quality of work accomplished in agricultural science in the United States has been menaced, and still is, by the extraordinary growth of institutions for agricultural investigation. * * *

As among the remaining factors related to agricultural investigation in the United States, permit me to briefly refer to the much discussed adjustment of teaching and investigation in its bearing upon the efficiency of our experiment stations. There is an unquestioned advantage to an experiment station, we all admit, in locating it in a college or university environment, provided the relations established are of the right sort. The college atmosphere is essentially speculative, and is conducive to reflection and inquiry, or should be, and in a community of teachers and students we generally find a desirable, intellectual, and social stimulus.

But the record of the past twenty-five years does not justify us in expecting a fruitful research effort when teaching of the kind and amount that must be done in most of our land-grant colleges is a part of the duty of members of a station staff. It is conceivable that giving a few lectures on advanced subjects might be a distinct advantage to a research worker, but this can not reasonably be claimed for routine instruction in fundamental subjects. Observation shows that class-room work of this character will inevitably claim the first place in the use of the teacher's time and energy. It is useless to ignore the plain results of experience. The fact that this combination of duties seems for the most part to have been unavoidable in our experiment station organization may excuse the situation but does not nullify its effects.

It is of little avail, however, to dwell on the past excepting as we glean the wisdom of experience. Our problems are with the future. As I see it, the further development of agricultural research in the United States lies primarily with the colleges and universities in the preparation of men and, secondarily, with the extent and conditions of the endowment of such research. Concerning this secondary factor little will be said at this time beyond the remark that it will be fortunate when our research efforts shall be further removed from the disturbing influences of an indiscriminating public sentiment and the uncertainties of legislation. We have no assurance that either education or research will develop normally or symmetrically if the purposes and methods of the class room and laboratory are to be standardized by a public conception of what is their immediate vocational or commercial value.

The present fundamental need, however, is for more young men endowed with a love of learning, of scholarly habit, and with integrity of mind and heart, whose ambition is not for notoriety but for the conquest of truth, and who, with more thought for service than for salary, are anxious to aid in laying broad and deep the foundations of human thought and activity. For this reason, in the progress of agricultural knowledge, I place the influence of the teaching institutions as the primary factor, because when there exists a body of men really possessed by the research impulse and with adequate training, inquiry will not wait on legislative authority and support but will proceed even under adverse circumstances. Whether the land-grant colleges are to train such men sufficient in numbers and ability to meet the demand is yet to be determined. So far these institutions have appealed for public support chiefly on the ground of educating farmers, and have pointed to farmer graduates and crowded short winter courses as a sure way of convincing the popular mind that public funds are successfully applied to the supposedly chiefest aim of agricultural education and are not being exhausted in the labyrinths of learning characterized as useless.

It is a serious question whether we are right in our educational plans when we place almost the entire emphasis upon the commercial or business side of agriculture and the industries, or whether in doing this we are promoting the highest utility of agricultural and industrial education. It is not now the privilege and duty of at least some of the colleges and universities here represented to more fully nourish and develop the spirit of inquiry? Should you not dliberately set about recognizing and encouraging scientific initiative among your students and organizing courses of instruction that shall give a substantial preparation for the work of investigation?

A New England college president, having in mind doubtless the older institutions of learning, once expressed the half-formed conviction that "the college is farther from the market place than is the church." It was evidently his thought that in the college, as nowhere else, are nourished and cherished the highest intellectual and moral ideals.

But here are institutions with new purposes and new relations. On their doorposts is written the word "practical" and in their class rooms the student is asked to consider the vocational side of life, and he learns of machinery and slaughterhouses and railroads and markets—in short, he learns of all that man is doing rather than of what man is thinking and dreaming and hoping. Is the future investigator, with his imagination fired by ambitions for larger knowledge, to come out of such an environment? Must we, as is so often suggested, turn to the older colleges and universities for our future leaders in agricultural science? We may not do this with much encouragement until in certain great academic centers there is a change of attitude toward the problems of agriculture. It is greatly to be feared that the flavors of the farm are still obnoxious to the atmosphere of so-called pure science. We may well be solicitous whether the spirit of learning can survive in centers of thought where facts and principles are so constantly weighed and measured with reference to their material or commercial value. It is a serious matter if the new education that is now attracting to it thousands of our young men is to serve chiefly in commercializing rather than intellectualzing the most virile manhood of a nation that is already grossly materialistic.

Friends and fellow-workers, these problems are your problems. Now that an apparent transition in the aims and methods of education is in progress, the institutions you represent, founded as they are upon the broadest possible basis of educational function and leading as they do an invasion into new and untried fields, occupy a position of critical responsibility. May you possess such wisdom and such initiative tempered by the lessons of experience that your efforts will advance the intelligence and prosperity of the farm and shop, promote the love of learning, and uphold the standards of the scholar.

After adopting resolutions of thanks for courtesies extended the association the convention, at 11.30 o'clock a. m., adjourned sine die.

MINUTES OF THE SECTIONS.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

Afternoon Session, Tuesday, May 28, 1907.

The meeting was called to order by the Chairman, E. A. Bryan.

Securing State Support for Land-grant Colleges.

G. E. Fellows, of Maine, spoke on this subject, as follows:

It is unnecessary to go into details of the history of land-grant colleges in this country. The material in existence on that subject has served as a text for sermons and subject for speeches by almost every person interested in land-grant colleges in the country at various times.

Education in the primary schools, at public expense, began early in New England, and very little education was offered at public expense until the nineteenth century, except in primary schools. In the nineteenth century education began to be an object of interest to taxpayers, and by the end of that century secondary education was thoroughly established in most of the States of the Union. So thoroughly, indeed, that many of the perpetually endowed academies of secondary education had given way to publicly supported high schools, which now exist almost everywhere. But higher education was not provided for at public expense to any considerable extent until after the land-grant act of 1862. The great significance of the act of 1862, therefore, rests in the fact that it established permanently the idea of higher or college education supported at public expense. There are members of this association who will say that the State university was established before the land-grant act. That is true, but the permanent interest in higher education has developed from the grant of 1862.

The great difficulty in eliciting public interest for the first twenty-five or thirty years was owing probably to the colleges themselves. They had not up to that time found a way to impress themselves and their usefulness upon the public. Of course, here and there scattered over the country are land-grant colleges which were well supported twenty years ago, and in a few cases agricultural colleges received reasonably good support before the land-grant act was passed; but any appropriation to make it possible to give any education beyond primary grade had little enthusiastic support until quite recently. I think, of course, that no one here would say that the State should not give support to land-grant colleges. All of us undoubtedly desire State support for the institutions with which we are connected. But there is a better reason than that. Ordinarily the taxpayers will support anything from which they get anything in return, or seem likely to get anything in return, probably not otherwise. The results must be favorable to the State before the State will be willing to return in the form of dollars anything that has been done by a land-grant college.

The land grant originally was never intended to be sufficient for all the work contemplated in the land-grant act. We have abundant assurance of this in the statements of Senator Morrill himself at different times. In the first place the land-grant act contemplates an institution of such vast scope that in no State, even with the wisest possible use of the land, could the income have supported such an institution as was contemplated. Perhaps New York or Iowa might be cited as States in which the land grant has been more wisely used than elsewhere, but neither of these had sufficient income to support the institution in its entirety and the original act is now supplemented by support given by the State itself.

These are Senator Morrill's exact words with regard to the original land-grant act in a speech made before the Vermont legislature:

"It is, perhaps, needless to say that these colleges were not established or endowed for the sole purpose of teaching agriculture. Their object was to give an opportunity for those engaged in industrial pursuits to obtain some knowledge of the practical sciences related to agriculture and the mechanic arts, such as they could not obtain at most of our institutions called 'classical colleges,' where the languages—Greek and Latin, French and German—absorb perhaps two-thirds of all the time of the students while in the college. Obviously not manual but intellectual instruction was the paramount object. It was not provided that the agricultural labor in the field should be taught any more than the mechanical trade of the carpenter or the blacksmith should be taught. Secondly, it was a liberal education that was proposed: classical studies were not to be excluded—they therefore must be included. The act of 1862 proposed a system of broad education by colleges not limited to a superficial and dwarfed training, such as might be had at an industrial school, nor a mere manual training such as might be supplied by a foreman of a workshop, or by a foreman of an experimental farm. Experience in manual labor, in the handling of tools and implements, is not to be disparaged. In the proper time and place it is most essential, and generally something of this kind might be obtained before or after the college term, but should not largely interfere with the precious time required for a definite amount of scientific and literary culture, which the earnest students are apt to find far too limited."

These words outline the work of the land-grant college as one of large comprehensiveness embracing everything now given at Ann Arbor, Cornell, or the University of Wisconsin. The institutions named are typical of three great classes which should have State support.

It might also be questioned whether the States do support or should support higher education. That question has been answered affirmatively in every civilized nation in the world, and in every State in the Union, except, perhaps, five. Four are New England States, the other is Maryland, and it is possible that these five States are making some appropriation, but are not undertaking the whole burden. No argument is necessary in Kentucky or Michigan, Iowa or California, where the State supports the land-grant college.

The institutions in the States probably need more money than they get, and the practical question is, how to get it. Nearly every one of you has had practical experience in securing State support for a land-grant college. Your methods differ with circumstances. The land-grant college ought to be made practical as well as theoretical, and we must make it a benefit to all parts of the State before we can go before the legislature and demand support. Some legislatures are liberal and give appropriation without much argument and as a matter of course, but in other States it is not so easy a matter, and much work must be done before the people appreciate the value of the institution. The people will appreciate the benefit done them if they can estimate it in cash. If the farmers can say, "The college has improved my bank account by so many dollars," they will support the application to the legislature for support. In some States it is not difficult to show this. The legislature may be approached through boards of trustees, through the agency largely of the president of the institution, or it may be appealed to through the influence of the alumni and students. I should say that where the necessity is great and public sentiment unfavorable every legitimate agency should be used to get an unwilling legislature to appropriate money for the support of a land-grant college.

I have no doubt that the committee asked me to speak on this occasion because of the conditions existing in Maine and of the results of our efforts to get an appropriation from the legislature. It is true that this last legislature appropriated nearly $20,000 more for the next two years than had been previously appropriated for ten years. Every alumnus in the State was notified that the ten-year appropriation was about to expire and a new appropriation would be necessary if the institution were to continue to live—a new appropriation considerably larger than the previous one if the institution were to maintain its present condition and usefulness. Presumably these alumni would be anxious to see the local member of the legislature and present in advance of the meeting of the legislature the needs of the institution as far as understood by them. The difficulty is that those not on the ground are not familiar with the needs of the institution. When they are asked why a certain amount is asked for it is very difficult to answer. I think it is a mistake not to have every member of the institution, whether trustee, teacher, or laborer on the farm, fully conversant with the general financial condition of the institution. We are very apt to keep the finances to ourselves, but it should not be so. The books ought to be open to the knowledge of everyone in the State in a general way, and in a particular way to everyone in the institution, because the professors who go out to lecture and the students who go home to the farms are often asked by different members of the legislature about the institution, and they should be prepared to give the information desired. The conditions should be understood by the students almost as fully as by the president himself. Then if they meet some farmer who is going down to the legislature and who has never heard anything about the college they can tell him just what is needed and it will be much more effectual than anything you could say yourself. Personally, I know that I can not do one-tenth as much good in pleading the cause of the college before the legislature as a member who has gained his information of our actual needs from some other source.

It is also the mission of the institution to do what will please the whole people, in some way. The running of special trains, corn trains, and the like, has been very beneficial to the college. They have set the people to thinking, and more people to talking. Nevertheless, they are not as effective as a department demonstrator, who stays in a place two or three days and then goes into another community. A train stays in a place perhaps two hours, teaching agricultural subjects, and it does a great deal of good, but not as much as the agricultural demonstrator nor correspondence study in general extension work. The train is, however, something that gets a hold on the public and induces the legislature to give of its abundance.

To summarize, the way to get State support for the land-grant college is to have the college affairs and finances well known by the people, to have the college useful to the whole people, and to have the college conduct enterprises which are conspicuous.

W. A. HENRY, of Wisconsin. If you expect a harvest, you must sow your seed long before. There must be a seedtime. Now, one of the great helps in advancing agriculture is to bring great bodies of the common people to the college.

The excursion effort of the Ontario Agricultural College is probably the most perfectly carried out of any method. About 40,000 farmers and other citizens visit that institution each year. In Iowa college and railway officials have combined for splendid results. At the Iowa college as many as 9,000 people have been on the grounds in a single day. Wisconsin has done something and will do more. Last year an excursion train was run from a northern part of the State, coming so far that the farmers were obliged to remain overnight in Madison in order to properly visit the college. This special train was from a pioneer region in Wisconsin. When the people, some 300 in number, had assembled in our auditorium, in welcoming them I made the prediction that this visit would be worth a million dollars to Barron County—the one from which they came. This statement naturally gave the farmers a jar that set them to thinking. On the 29th of June we are going to have a duplicate of last year, only this time we will get 500 people from Barron County, where only 300 came last year. The farmers of Barron County, because of what they learned at the college last year and the inspiration they received, are forming organizations for cooperation for mutual advancement. They are importing large numbers of pure-bred animals, testing their herds for tuberculosis, and taking many other steps for mutual advancement and improvement. The whole effort is the result of their visit to the agricultural college last year.

Another matter of great importance is the education of the legislature. In this State (Michigan), as you are aware, the members of the legislature travel by special trains, visiting the various State institutions, penal and educational, to study their conditions and needs. This is certainly a wise and important provision. In like manner, great good can be accomplished by having members of our legislatures visit the agricultural colleges and become personally familiar with the work they are doing. The value of such visits can not be measured.

Another matter of importance is to educate the trustees of the institutions. It is quite common for the president and professors of any given institution to be unstinted in their praise thereof. They affirm it is the best in the country. We are apt to hear the president say that his agricultural college has the best machinery, the best library, the finest flocks, the largest and finest herds of cattle, and so on. The trustees of the institution and the people round about, hearing these positive assertions, come to believe them to a degree which is unsatisfactory to the president and others who have made them. They come to think that if their college is already in the lead, what is the use of more buildings, more equipment, more live stock, more land, etc. Now, no one college is the best, no one college has all the good things in advance or excess of all others. Some of these very presidents who are so boastful should first of all visit similar institutions and get their eyes opened. This done, they should next seek to get their trustees educated in the same manner. When president and trustees have looked about them as they should, they will generally find plenty of places to be strengthened in their own institutions. There is no other form of education that will take the place of travel.

The short-course student in our agricultural colleges is a powerful ally toward the betterment of the college. My observation and long experience have shown me that the young man from the farm who has attended an agricultural college for even a single winter, and then returned directly to his farm to there take up work again, is often a stronger ally and friend of the institution than the student who has been there four years, receiving all its benefits and getting a degree as a result. It is a sad thought, but too often the case, that young men who have studied in a college or university for four years have come into a line of thinking which leads them to believe and act upon the theory that the world owes them a living, that in some way we do not understand they are made of different clay from ordinary mortals. This is a most regrettable situation, but all of us have witnessed too many examples of this pernicious lack of honest appreciation from college graduates. It does immeasurable good to bring in young men and mature ones directly from the farms to our colleges, keep them there as long as we can, and send them back with as much training and information as we can impart during their relatively brief stay. Any one of us who has had experience with this class of people who have received help from our colleges for a brief period knows what I say when I affirm that no class, as a whole, attending our educational institutions is so appreciative and afterwards so loyal and helpful as those who come for the shorter courses.

R. W. Stimson, of Connecticut. Six years ago when the fall term opened our college had but 18 students. This year, including our winter school and summer school, we shall have 250. We had been for years unable to get a dollar for buildings or of increase in our maintenance appropriation. At once we set about increasing the usefulness of the college to the people of the State, and thus we have secured their influence and support. In speaking of our success, I want to give an instance or two to bear out what Dean Henry has said about the short-course men.

We gave a six weeks' course in poultry culture in our institution, and some poultry fanciers as well as beginners came to take it. We gave them not only instruction on poultry, but also, for example, lectures on the subject of soils and fertilizers. One man, who is now the secretary of our very strong State poultry association, has stated several times in public that the first year after he took the course he saved for himself and a neighbor over $200 in the purchase of fertilizers. In accordance with ideas he had got from the lectures, he bought his fertilizer chemicals, mixed them at home, and applied them in vegetable and tobacco growing. This was a return of dollars and cents to him. It is needless to say that the college gained his respect and influence.

Another man who came to see me about taking the short course in poultry had been in the business of poultry breeding, and had been an exhibitor of some repute. He was desirous of securing a position as manager of some large poultry plant. It had occurred to him, he said, that it might be of advantage to him to be able to say that he had taken this short course, though he did not expect to get very much out of the instruction. He learned a few things about poultry breeding that he had never dreamed of. The things one short-course man learns of another are often of quite as much value as what the men learn of the professor, and I think that the association of short-course men with the professors is of immense advantage to the latter in their efforts successfully to instruct practical men in practical affairs. The man I have just mentioned has been a firm advocate of the college ever since he took that short course, and for reasons which he did not contemplate when he entered.

Our summer school for teachers has also from the outset contributed to our success. The coming July (1907) we shall hold our sixth session. There were 84 people in this school last July (1906) devoting their time exclusively to the study of nature and country life. We do not keep these teachers too long. We give this work in July, partly on account of the teachers who attend and partly in order to keep August and half of September free for our own men. The success of this work has been wonderful, and we find that some of our very best advocates in the State have been these teachers. Farmers and the people in the towns and villages—for about 33 per cent of our students are from villages and cities—have naturally argued that if we can teach teachers what and how to teach, we must be good people for teaching their boys and girls.

The teachers who have attended our institution have created a public sentiment very favorable to us.

Another strong ally is the grange. The executive committee of our State grange was invited to investigate our institution. It came and decided that it was worth supporting, making a public report to this effect. The master of the State grange recently joined with me in a call to the farmers throughout the State to send representatives from their local granges to a hearing on our new dormitory bill before the committee on appropriations of our legislature. When the time came for the hearing, the largest room in the capitol could not seat all the people who came and the appropriation of $60,000 we asked for was granted.

We have found the grange a splendid organization of farming people, and certainly in our State the State grange and the subordinate granges are strong allies of the agricultural college. We have found short courses very useful, indeed; and I believe those institutions that have not conducted summer schools devoted to the study of nature and country life will find them most excellent for promoting the interests of their agricultural departments.

THE SELECTION AND RETENTION OF AN EFFICIENT TEACHING FORCE.

W. E. STONE, of Indiana. The problem of maintaining an efficient corps of instructors is especially serious in our land-grant colleges. There are many reasons for this, and to one or two of the most weighty ones I will refer particularly. First, most of these colleges are facing a condition of extraordinary drafts upon their funds, so that they are practically unable to pay the salaries which should be paid for the service needed. Second, there is a very great dearth of competent teachers in the technical subjects which we are called upon to administer. It is difficult to persuade the young men graduating from our institutions to take up the career of teaching. They wish to go into business or into the commercial side of the things which they have been studying. There is no question but that, in order to command suitable teaching material, the price paid for it must be increased, although few of the colleges can afford to expend much more money for salaries than at present, and in addition something must be done to induce young men to enter teaching careers. The situation is very perplexing.

The land-grant colleges stand before the public as a well-defined group of institutions, and in a sense they are measured in public estimation not by the work of any one institution, but by what the whole group achieves. It is therefore important to keep our work as a whole up to as high an average standard of excellence as possible.

There is occasionally an institution with sufficient funds to draw to itself, by offers of large salaries, teachers of commanding ability, but whenever that is done some other institution is weakened. For this reason it would be well if the land-grant colleges could avoid the indiscriminate raiding of each other's faculties. Suppose an institution has given a promising young man special opportunities for development and spent money on his department in order to bring it up to a high state of efficiency, and just about the time he becomes fairly efficient and is making some return to the institution for its investment in him some other institution offers him a larger salary and takes him away, perhaps in the midst of the year's work. His successor will probably be a man of somewhat different views and ambitions, inclined to reject the equipment and the work done by his predecessor and to demand new expenditures on new lines. What is the result? The work of a department is interrupted and there is a waste of funds; some one is taken from your institution; you draw from another to fill his place, that other from a third, until a number of institutions have been demoralized in some department of work, and scarcely one is any better off than at first. There should be some other method of procedure less destructive and wasteful. I do not think it is right to take a man away from his work and his students in the middle of the year, nor do I think it right for one occupying a leading position on a faculty to resign his position without a considerable period of notice. Men have been drawn from Purdue in the midst of the year's work with only a few weeks' warning, and with an effect on their classes and work that is easily imagined.

It seems to me that an excellent principle to follow in maintaining a faculty is to rely as far as possible on the training up of young men within the departments to fill the high positions as need may arise. Encourage them to look forward to a career along that line. Let them grow up in your institution knowing your plans and your people. Perhaps that is the most hopeful way of obtaining a good man to take charge of the department in time of need. Such a man, other things being equal, will be more efficient than a stranger.

Another condition which is on the increase exerts a tendency to lower the efficiency of the teaching force. Young instructors are too often thinking more about their salaries than about their qualifications. Their ambitions are not toward study, investigation, and development of efficiency, but toward more salary. I think no man will make a successful high-grade teacher or investigator who puts first among his ideals how much he is to get for his services. I wish every man to receive all that he can earn; he deserves to have it. But whoever devotes himself with single mind to perfecting and improving the quality of his service need not be concerned about his salary. He will get his reward as a matter of course. But a great many of our young teachers are losing sight of this fine old notion and are uneasy, discontented, ambitious, and ready to go at any moment to another place if they can earn a little more salary. There is, it seems to me, a sentiment among them that operates against their becoming efficient members of a teaching force.

I have no formal remedy to offer for all this, but I believe that we should consider, in making up our faculties, the general principle that it is unwise to strengthen one at the cost of another, and seek to avoid as far as possible interrupting or weakening the work of other institutions. I also believe it to be of prime importance to the land-grant colleges that a strong and, possibly, a concerted effort be made to increase the available supply of instructors in technical subjects, as well as to encourage the pursuit of the true ideals in the teaching profession.

H. J. WATERS, of Missouri. The buildings and the equipment of an institution are as nothing in comparison with the men themselves. There is no possible way by which an institution can become great and strong without strong men in its teaching and investigating force. Therefore in the selection of the men to fill these places comes the greatest responsibility attached to the administration of the institution. I do not agree at all with the position taken by President Stone—that the best way to get strong men is to grow them at home. I believe that to persist in that policy would produce a weak institution, with men of narrow ideas and limited points of view. The very best thing is to go out and select in the whole country the best men to be found for the money, regardless of where they are. That policy is bound to get together strong men of broad horizon. But I believe thoroughly in the other position taken by the former speaker—that it is wrong for a man to leave during the session or for an institution to take him away at that time.

I think a mistake is made in keeping men tied down to some system, running along in the same groove. Much depends upon the amount of liberty which is given them, the amount of opportunity to make for themselves. We fail to consider differences in temperament, desires, and ambitions. If one desires to conduct certain lines of investigation and will not be happy unless he is permitted to do that sort of thing, why not let him do it? He will be much happier. If it is the policy of the institution to do something else, let the policy be adapted to the present situation. Another man who can not do investigating is a superb teacher. Let him teach, and get some other man to make the investigations. A man is always most successful in the work to which he is inclined, and if he is given an opportunity to do these things and keep abreast he will render every possible service to the institution.

E. R. Nichols, of Kansas. In seven years we have had 42 new heads to our departments, an average of six new members in the faculty every year. We have only 27 departments in all, so we have changed about one and one-half times. But the situation is getting better, and this year, for the first time, there have been no changes in the heads of the departments.

A phase of this question that has not been touched is the board of regents. I think that board should be relatively small, and should not be changed more than one member in two years. The feeling of uncertainty has hurt our institutions more than any one thing. It is true that we have paid low salaries, but I believe that we can keep our teachers if we can give them some assurance that they can stay as long as they do good work. One reason for low salaries has been the difficulty in getting the legislature to appropriate sufficient funds. This last session we got half as much money from the legislature as it had given us in the preceding forty-four years. We are going to put a large part of that increase into salaries, and are not going to let the other States rob us of our teaching force if we can help it. Yet I do not mean to say that the salary will be the principal inducement to stay. I believe that the assurance of permanency and of a favorable policy on the part of the State toward the institution will be worth more than a few extra hundred dollars that another institution may offer. I have great faith in the teachers, and know of some who have refused better positions on account of devotion to their work.

If we lose a teacher through business attraction or by the hand of death, of course something must be done. We haven't a sufficient number of assistants to keep the work going, and the vacancy must be filled from some source. Teachers can move at very short notice, and I suppose we must meet this condition for some time yet. I hope that teachers will become available as fast as we need them in the institutions, and even a little faster. Culture and training are demanded in an agricultural college just as much as in a university.

W. D. Gibbs, of New Hampshire. It seems to me there are two distinct phases to this question; one is procuring and keeping efficient men, the other is getting rid of the inefficient. One is as important as the other. If there is any easy and effective way to dispense with the services of weak, inefficient men in college and station work it would be a splendid thing for us all to know.

In connection with securing and maintaining an efficient teaching force, I agree that it is usually entirely wrong to take a man from an institution in the middle of the school year. And it is equally wrong for any commercial or other enterprise to take men from us under similar circumstances. The golden rule should be observed.

In the matter of salary my own feeling is that it is a worthy ambition for a man to desire advancement. We all desire to earn and to receive more salary and, I think, legitimately. I do not think that many men engaged in agricultural college work can be accused of hoping to become millionaires or anything of that sort. They want more salary to enable them to live better and render better services. Meager salaries are not conducive to the highest type of service.

I do not believe it is right to pay all professors of equal academic rank the same salaries. They have different earning powers. Some institutions have a limit, and when a professor's salary reaches that he can not expect anything more unless he moves. In thus fixing a limit we are reducing the standing of the professor to the level of the labor union men. In many institutions with such a system, there are some men receiving, say $2,000, who are worth $3,000 or $4,000, and others receiving the same amount who are not worth anything. It seems to me that one good way to establish an efficient force is to pay each man as nearly what his services are worth as is possible. This will mean rapid advance for the efficient and stagnation for the inefficient, with the result that the weaker men will become discouraged and resign.

C. E. Bessey, of Nebraska. I spoke recently as a college president; I speak now as a plain college professor. In my opinion, at the installation of the department and the appointment of every instructor is the time to keep out the inefficient professor. The selection at the beginning is the critical one. When the head of the department is properly chosen, he should be allowed to select his own corps of assistants. In the selection of the instructors many of the college presidents want to dictate (and I suppose they must have something to say in the matter), but the professor should pick out the man who has the teacher in him; not only that, but the possible future professor, or even future president of the institution. At the beginning is the place where we must do our sifting; it is much easier to keep out a poor man than to get rid of him after he once gets a foothold. The men who increase in efficiency should be promoted from year to year, and the men who do not improve should not be promoted, but even then the poor men will not invariably resign. The very poorest certainly will not.

I do not think the colleges should spread out as much as they are doing, adding this and that department in order to present a more rounded and more symmetrical appearance. That is where so much college money goes, that when it comes to paying professors adequate salaries there is not enough to go around. I thoroughly agree with the speaker that the men should be paid what they are worth. Nearly all of us will agree on that. A fixed scale is hardly practicable. Many years ago we had such a scale in the University of Nebraska, ranging from junior instructor at $800 to full professor at $2,000, no man getting more than his grade called for; but we found that we had to abandon this practice, for some times we wished to promote a man as teacher when we could not increase his salary.

After the annual meeting of the college trustees there is often a general feeling of unrest mingled with indignation over the fact that requests have not been granted as to salaries or as to appropriation for departmental expenses. This takes away very much from the efficiency of the college machinery. You can not have good work in an institution by shaking it up. Just how to avoid this it is extremely difficult to say. But if an appropriation is made by the legislature for an increase of salaries the president and trustees should by all means see that the salaries are actually raised. Living costs more than it did years ago, and the salaries which we found fairly adequate then are generally inadequate at the present time. The fact that professors are heads of families, have a place in society to maintain, and must spend more money than they did twenty years ago should be considered. Second I should put the maintenance of the work of the departments. Sometimes a man will stay on a lower salary if he knows that his department will be adequately sustained. The professors are not all of them looking after the "almighty dollar" merely for the sake of its being a dollar, but men will not stay with any degree of restfulness if they are cut short both on salary and in appropriations for carrying on their departmental work.

E. DAVENPORT, of Illinois. It is commonly believed that instructors teach for the love of teaching, and that specialists investigate instinctively, both without much reference to compensation. Whether or not this is true of other subjects, it is not true of agriculture. Our successful teachers and investigators are not blind to the money question. The subject is fundamentally an economic one, and men fitted to treat it successfully are by nature keenly alive to business affairs. For this reason, if for no other, salaries in agriculture must be fixed with some reference to what successful men are able to earn in other professions. While salaries in public service can never run as high as the extremes in private business, yet the discrepancy can not safely be too great.

There is another side to the same question, however. If the departments are strongly equipped with excellent men at the head, then young men can be secured on almost their own terms, for the privilege of serving in these departments is a valuable one. On the other hand, if the policy of the institution is not to retain the strongest men for the department heads, then there is no inducement to young men except that of salary, in which case more money is likely to be paid out in order to secure the help of young men than would be necessary to conduct the affairs of the department if a larger proportion of it were paid to the principal men. In other words, the same money is used to better advantage when the heads of departments receive liberal salaries than when special economy is practiced at that point.

There are two other matters that go far toward making college positions desirable or undesirable, particularly so far as heads of departments are concerned.

In some institutions after a man has been employed for several years he is sent abroad to improve himself, but he is pledged after he returns to put in three years of service in order to pay the debt. What kind of a proposition is that to put up to a man? It would be against any business man's principles to agree to it. Why exact this promise from the man? He is either a member of the institution or he is not, and when the time comes that a professor or an assistant professor can go abroad to become more proficient, he should be given leave of absence on the assumption that he will be honorable in the matter upon his return.

The other consideration to which I have alluded as especially concerning the head of the department is this: In many institutions there is no assurance as to how much money is available for department work. The head of the department assembles all the arguments he can for money and gets as much as possible, renewing the request whenever an opportunity arises, but he never knows as a settled principle how much money is available for his department each year. This hand-to-mouth policy is most discouraging to department workers, and I believe most vicious in college and station affairs. In the name of all that is business sense and all that is fair, let presidents and boards of control determine what departments shall be founded and for what purpose; then having determined these points, let them frankly state how much money is available for each department annually, so that those in charge may know precisely what plans can be made and carried out. I am one who strongly insists that if the head of a department of an economic nature, like agriculture, is unable to plan his affairs with reference to a stated amount of money, he is for that reason unfit to head the department.

I earnestly urge those policies which will enable departments to know definitely what plans may be made and carried out, so far as funds are concerned, at least for a year at a time.

AGRICULTURAL EXTENSION AS A FACTOR IN COLLEGE AND STATION WORK.

The following address was delivered by F. H. Rankin, superintendent of agricultural extension, University of Illinois:

The work of agricultural extension has grown out of the needs of the farmers and the desire of progressive institutions to win the regard of farmers as well as to instruct and assist them. Many agricultural experiment stations have been and are doing much work of an extension nature in the way of dissemination through printed bulletins, correspondence of station officials, demonstrations, lectures, and other lines of work. The spirit and necessities which prompt this kind of service to agriculture are to be commended, but it may be asked: "Does not this work of dissemination merit a greater prominence?" Farmers have come to use college and station workers and to appreciate what has been attempted in their behalf, and there is a demand for further systematizing, perfecting, and expanding along these lines of effort.

More is expected of colleges and stations than formerly. Our stations should give their best in men, in time, in money, and in energy for concentration upon the gigantic problems of genuine agricultural research. In college work our young men are rightfully expecting a high grade of instruction. The stock information as taught in the desultory way by the old "professor of agriculture" will not keep pace with the demand for scientific basis for teaching and practice. Our investigators and teachers must give more time to the field of effort for which they are especially trained. Only then will high-grade research and the best quality of class-room instruction be possible.

The extension worker or middleman should have ability to combine science with practice. He can conduct much of the college and station correspondence, help at institutes, arrange for excursions to the college, edit special literature, organize school and home improvement clubs, coordinate the work of agriculture in secondary schools, and in many other ways keep in touch with farmers, teachers, and prospective students, and thus give our constituents far more extended and efficient service than they would otherwise receive. Dean Henry has forcefully said: "A manufacturing corporation employs workmen, inventors, designers, draftsmen, pattern makers, office force, and, last but not least, a corps of commercial travelers whose sole business it is to advertise and place the manufactured articles with the customers. The commercial traveler or middleman is of the greatest usefulness in the industrial world. It is time we recognized the necessity of the same factor in our college and station work."

The agricultural colleges have worked out and formulated much scientific knowledge which is admirably adapted for instructional work in the secondary schools. The University of Illinois has taken up the training of teachers of agricultural science for the secondary schools, offering two special courses, one intended for students who have had not less than two years' work in agriculture. This course will be devoted mainly to considering what features of agricultural science are best adapted to high-school conditions, the best order and methods of their presentation, treating especially of the pedagogic side of agriculture. The other course is intended primarily for those who have taken the literary or scientific courses and who are preparing to teach in the secondary schools, but who have had no work in agriculture. This course deals with elementary agriculture, touching upon the high points, as it were, in agricultural science. I believe there are many good reasons why we should look to the high school for the successful introduction of agriculture into the public school system. These secondary schools have served certain interests and certain people extremely well. Our farmers are now asking that they serve agriculture as faithfully and as well as they have served those who are training for professional lines.

Agriculture has made its place in our large universities and the seats of higher learning, and it is now finding its place in the high schools of the country. The high schools of Illinois are desired to do this very thing. Literally hundreds of our best teachers are earnestly asking themselves how best to adapt the school to the needs of the country people. Agricultural science offers subjects for mental training unsurpassed by any other science to be found in the curricula of our public schools. It has been stated that nearly one-half of the school children of the United States are in the country schools, and that to more than 95 per cent of this one-half these same country schools are their only alma mater.

Before instruction in agriculture in the smaller schools can be made a success, there must be teachers with especial training for this work. An important feature of our extension work is to secure a body of better trained teachers who shall give instruction in the elements of agriculture. With conditions as they are in Illinois, we do not favor the segregation of young people into special agricultural high schools which duplicate to some extent the existing system. Let us keep as free as possible from class distinctions. Our agricultural schools and courses are not to train for farming exclusively, but for intelligent, broad-minded citizens, who know how to farm successfully. We do not need schools of agriculture any more than we need schools of English or algebra, but rather schools in which agriculture is taught by teachers thoroughly prepared for the work and who can teach it in its relation to the other sciences in the school.

In Illinois much of our extension work is done in cooperation with the State farmers' institute, in their corn-growing and corn-judging contests. Through the medium of excursion parties from different counties—the last one numbered over 1,400 persons—many parents come and bring their children and personally investigate the opportunities offered at the college of agriculture. Who can tell the thoughts that run through the minds of these boys and girls when they first go through the college halls?

We have a mailing list of the names of several thousand young people with whom we are in direct correspondence and to whom we send, from time to time, specially prepared literature concerning college and station work. Among the leading features of extension work are personal correspondence and visiting many of the homes of young people, the organization of young people's experimental clubs, and excursion parties to visit the College of Agriculture.

Briefly the results which attend this work are as follows:

(1) An interest in agriculture is awakened early in life.

(2) A marked increase in the attendance at the College of Agriculture each year.

(3) A better preparation on the part of the students.

(4) A more general appreciation among young people upon the farm of the advantages of higher education in all lines.

(5) A wider and more intelligent conception of what the college of agriculture and university are doing, and of their needs.

There is much about this work which can not be tabulated or expressed in words and figures, but it is evident that fruit has been borne along the lines mentioned, and the belief is cherished that what has been accomplished is but a fraction of what is bound to follow the cumulative effects of this line of work. That there is room for and need of the State adopting this policy in her education of the young people of the farms to develop her agricultural productivities is best answered by referring to the hundreds of letters which these young people write and the buoyant enthusiasm with which they enter into this work.

Agriculture stands distinctively as one of the few callings in which the individual man may be himself, think and express his own thoughts, carry out his own policies, and largely shape his own life.

In almost every avocation in life the man is hampered and hindered. If the place he occupies is humble, only so much the worse; but even though he occupies a high position, he finds himself, in attempting to carry out his policies, that there are other men, equals or superiors possibly, who must be consulted and argued with, and that at many times his desires and strong convictions must be shaped and modified, and not infrequently they are abortive. Presidents or general managers of great corporations are often under the restraint of implacable stockholders. Even directors of agricultural experiment stations and presidents of great universities must answer to boards of regents or trustees.

In politics it is even worse. High officers, governors of States, and mayors of great cities must frequently stifle some of their personal convictions and perhaps be blind to the misdeeds of heads of departments who are ostensibly subordinate to them but are, in fact, contemptuously independent of their chief executive. Many times a good man is forced to grovel to his political boss. Frequently men in important positions stand before the people as in the plenitude of power while submitting to the most humiliating dictation from the rear.

But who shall say to the farmer, "Plant this field of corn," when in his judgment it should be planted with some other grain or not planted at all?

Who may dictate to him in any other particular? He does not have to yield to the opinion of other men or to defer to the prejudice or placate the jealousies of any man or any set of men.

Such movements do not arise spontaneously and conduct themselves to successful conclusions. There must be leadership and rational direction. Methods of work can not be talked out or bottled up in sentence parcels for use when wanted. There must be real earnest workers. The fundamental question of agricultural leadership must be first settled before methods are worked out.

Upon this point let me say that there is but one purpose to be served in all this matter, and that is the development of agriculture and an agricultural people. It is to develop a mass—not a few, but a mass—of men and women capable of conducting this more difficult agriculture, capable of taking care not only of the commercial side of the business, but of the fertility and productive power of our lands; more capable of founding homes for the production of typical American citizens.

This movement of extension is not solely for institutions such as agricultural colleges and experiment stations, yet under it and by it they will be built up to a higher efficiency than they have yet enjoyed. It is a movement for agriculture.

The policy adopted in Illinois, and under which the interests and organizations looking to improved agriculture have harmoniously worked for over a decade, is that the farmers are the ones to lead in this movement. The gist of our extension work is in this: The special branches of agriculture maintain an organization of leading men who are specialists in that industry. Thus, we have our State boards of agriculture, live-stock breeders' association, corn growers' associations, farmers' institutes, horticultural societies, dairy, poultry, and bee keepers' associations. These organizations truly and fully represent agriculture, because their membership consists of the most progressive and in every way the most representative farmers who most truly represent Illinois agriculture, and thus fundamentally are in a position to know what ought to be done. However, none realize better than these same men that they do not know how to do all of this work, and that these organizations do not possess the potentialities to work out all the problems involved. Most decidedly they do not, and here is where the agricultural college and experiment station must contribute a large share. But, fundamentally, the Illinois plan is that agricultural leadership rests with the agricultural organizations, and, through them, agricultural extension would magnify the interest for which they stand.

The agricultural college can teach advanced ideas and methods, the experiment station may discover new truths and advance new theories; these are necessary to progress, but they do not constitute real leadership. In fact, I doubt if the development of our agricultural colleges and experiment stations will proceed much further or faster than the leading farmers can be induced to move.

The agricultural associations of a State represent its agriculture as truly as it can be represented, and on them the responsibility of leadership should be pressed. If they accept this duty of leadership, then certain responsibilities must follow. Each separate organization must see to it that all forces organized for the purpose of agricultural advancement work together harmoniously; that they are effectually and effectively organized, and that each understands the place it is to occupy and the work it is to do, and then set about doing it. Here is where agricultural college extension may render distinctive service.

Of all the agencies working for agricultural progress, next to the farmers themselves, there are none that deserve and should have the support of these organizations more than the agricultural college and agricultural experiment station. Both are working in new and difficult as well as technical lines. Both are fundamental to progress and both are absolutely dependent upon agricultural people for their very existence. I verily believe that from now on the strong colleges and stations shall be the ones that have the active support of the farmers' organizations of their respective States. The colleges and stations have the right to look to the farmers for guaranteed loyal and hearty support, and then let them serve agriculture effectively and religiously. There is much to be gained in keeping close to the people. In advocating that leadership belongs with the agricultural associations I would not detract one iota from any other agency of progress, but I would lay more responsibility upon the organization and endeavor to make it clear that the object of it all is very definite, viz, the developing of a permanent and profitable agriculture, and not the exploitation of individuals nor the fostering of any pet theory. Certainly no part of our educative system offers a broader or more fertile field than agricultural extension. Keeping in close touch with the higher scientific education of colleges, it serves as a medium for contact between agricultural colleges and experiment stations and the farmers, which is so necessary if the work of the colleges and stations is to be of the highest practical efficiency. It is the province of agricultural extension to disseminate the mass of agricultural literature, to arouse and sustain interest in experimental work, and to elevate ideals and the standard of living. It is a great work, but there is no leverage or influence so powerful and potent as young people of a community in the hands of wise and tactful teachers. It is a work which shall open a little wider the door of opportunity to those whose lives have been dulled and narrowed by the iron cast of circumstances.

Ex-Governor W. D. Hoard, of Wisconsin, spoke briefly, urging the extension of agricultural knowledge and the use of simple language in discussing agricultural subjects. (See also p. 104.)

ELECTION OF OFFICERS OF THE SECTION AND MEMBERS OF THE EXECUTIVE COMMITTEE.

The following officers were elected: Chairman, R. W. Stimson, of Connecticut; secretary, E. R. Nichols, of Kansas; members of executive committee, H. C. White, of Georgia, J. L. Snyder, of Michigan, and W. E. Stone, of Indiana.

AFTERNOON SESSION, WEDNESDAY, MAY 29, 1907.

The section was called to order at 2 o'clock p. m. by the chairman, E. A. Bryan, of Washington, and the following topic was taken up for discussion:

IN WHAT MANNER MAY THE COLLEGES UTILIZE THE PROVISO OF THE "NELSON AMENDMENT" AUTHORIZING "COURSES FOR THE SPECIAL PREPARATIONS OF INSTRUCTORS FOR TEACHING THE ELEMENTS OF AGRICULTURE AND THE MECHANIC ARTS?"

H. C. WHITE, of Georgia. Mr. Chairman, of course it is not to be expected that with the few of us here this afternoon we can have anything like an exhaustive discussion of this important matter. In point of fact, I have no paper prepared. Indeed, if there had been a general session I should not have prepared a paper. The topic is on the programme as the result of a discussion between Dean Price and myself and partly instigated as a result of an interview I had with the Commissioner of Education when I was in Washington in April in the discharge of my duty to obtain a ruling from the Secretary of the Interior on some points in connection with the Nelson amendment, as to which we wanted information.

The one point in which the Nelson amendment differs from other Congressional grants is just this, that permission is given for courses for the special preparation of instructors for teaching the elements of agriculture and the mechanic arts. I presume, of course, that we could have done all that without any specific authority, but this clause emphasizes the desire of those who had in charge the bill that some such appropriation should be made. Doctor Brown, who has recently taken charge of the Bureau of Education, is extremely interested in all matters in which we are interested in technical education and agricultural education. He is extremely desirous to come into close affiliation with this association, so, with the consent of the framers of the programme, I asked Doctor Brown if he would not come and discuss this subject. He told me that he would be very glad to do so, and we hoped he would be able to come, and that if he did not come in person he would send a paper on this subject. The following letter from Commissioner Brown is self-explanatory:

ANN ARBOR, MICH., *May 28, 1907.*

Prof. L. H. BAILEY,
President of the Association of Land-Grant Colleges, Lansing, Mich.

MY DEAR PROFESSOR BAILEY: Very greatly to my regret I shall be unable to be present at the symposium to be held at Lansing to-morrow afternoon. As I feared, when we spoke about the matter, the engagements which I made long ago will render it impossible for me to reach Lansing until to-morrow evening or Thursday morning.

I want to tell you how deeply concerned I am for the provision respecting the training of teachers for our schools of agriculture and departments of agriculture in our normal schools. The great movement for the extension of agricultural education throughout the country, which we have seen within the last year or two, is wholly unlike anything that has preceded it and has brought with it some very large and difficult problems. It must be clear to everyone that agricultural education can not be made out of paper and ink and legislative enactments. The one thing necessary is a body of teachers who know the subject and know how to teach it. Without such a body of teachers this movement for instruction in agriculture will certainly disappoint expectations generally; and if such a disappointment should intervene I very greatly fear that a reaction will set in which will be extremely unfavorable to the cause of agricultural education throughout the land.

It is very fortunate just at this time that the Nelson amendment to the agricultural appropriation bill for the year 1908 should have contained a permissive provision for the specific preparation of teachers of agriculture in the land-grant colleges. It will require the utmost good judgment to carry this provision into effect in anything like a satisfactory manner. For one thing, I fear there is a dearth of well-prepared instructors who can conduct the new courses for the training of teachers in the colleges. The men who have special aptitude and preparation for such work will need to be sought out carefully, and they will need to learn from every possible source what are the best ways of training teachers which have thus far been devised. It is not at all likely that such training courses can with advantage be introduced into all of the agricultural colleges. It is, in fact, desirable that they should not be introduced more rapidly than is compatible with effective organization, and it is of the utmost importance that no institution should undertake such work unless it is prepared to provide for it on a liberal scale.

If two or three institutions or even eight or ten institutions should make really adequate provision for the beginning of such instruction during the coming year and get the work into the hands of suitable men, I should think that a very fortunate start had been made. I look forward with very great interest to the bulletin which you have kindly consented to prepare for the Bureau of Education with reference to this new undertaking. I am confident that you will be able to bring together in that bulletin a good amount of advice and suggestion based upon practical experience, and that, as you will prepare it, it will be extremely useful to the instructors who will conduct the new training courses.

With very hearty good wishes for the discussion of this subject at Lansing, and anticipating the pleasure of talking it over with you Wednesday evening or Thursday of this week,

I am, very truly, yours,
Elmer Ellsworth Brown,
Commissioner.

In my own judgment there is no more important matter to receive the consideration of this section than this. There is a state of ferment the country over concerning the improvement of the elementary and secondary schools, and in many places the lines of improvement have run parallel to the energies and efforts which we are prosecuting in the colleges of agriculture and mechanic arts. A purpose to introduce in some manner agricultural education, manual training, and similar varieties of education in the lower schools is quite evidently in the minds of many people. In my own State, for example, we have recently established high schools in each of the Congressional districts, and they are called agricultural high schools. Of course there is great lack of knowledge as to what an agricultural high school is or should be and a very great lack of knowledge as to what they should do in those schools now that they are established. All this indicates that the preparation of teachers for the secondary and elementary schools, who shall be competent to carry on work of a character which shall be of genuine pedagogic value, is a very important matter. We are not the only people who are thinking about the preparation of teachers to do this important work. I have had several communications from gentlemen associated with normal schools, for example. I think President Butterfield, who is largely interested in this matter, has also communications of that character, the question being whether the normal schools would not be the proper institutions to prepare teachers for these elementary and secondary schools in the lines of instruction which are here indicated. Clearly, we should do it in the colleges if we can. Now, the question is, Shall we undertake to do this systematically? Shall we set aside some part of our means, some part of our college activities, for the specific preparation of teachers to teach the elementary branches of agriculture and mechanic arts in these lower-grade schools? And if we do, in what manner shall we do it? I hope there will be a very wide and general discussion of the topic. I hope we shall not undertake to settle it in a dogmatic way, and certainly in no speedy way. My hope is that we may give it our attention in a preliminary way at this meeting, and perhaps at the next meeting of the association in a larger assemblage than we have to-day we may come with more mature views to present, and in that way beat out some rational method of securing this end.

I have thought a little more specifically than that, however, on the subject, and these points have occurred to me. In the first place, if we are going to set out to train teachers to do this particular kind of work, it seems to me we should be careful along two lines. First of all, these prospective teachers should be educated as thoroughly as possible, in the lower courses at least, of our technical agricultural work and mechanic arts work. I do not know that it will be necessary, but it will be better, I think, for them to go on to graduation. It is quite likely, however, that many of the young men and young women who will be called on to do this work in the primary and secondary schools may not care or may not have opportunity to go on to full graduation in our technical colleges, but they certainly ought to have the instruction in the lower classes, at any rate up to a point which may be determined in each special case or perhaps which we may be able to determine with some degree of definiteness by our conferences here together. In other words, the person who is to teach agriculture ought to know agriculture. If we profess to teach agriculture in the colleges, then the people who are teaching it in the common schools ought to know what we are teaching in the colleges, and the more they know the better.

But that is not enough, in my opinion. I think the teachers at this juncture in the initiation of a great movement should be selected, so far as we have the power of selection, with great care. I think we should select people who are thoroughly sympathetic with the kind of education which it is proposed they shall give. I do not mean that they shall simply be young men and young women who have a particular aptitude for scientific work or who display particular ability in any particular technical courses, but they ought to be people who are in sympathy with rural life and have such sympathy as will give them an ability to make use of the surroundings of rural life in teaching the specific things which are to be included in the curriculum of the rural school. Therefore I think (1) that technical preparation of the character I have indicated is of the first importance; (2) that the possession or the development of sympathy, intelligent sympathy, is of great importance; and (3) that these young people ought to have some knowledge of pedagogic methods.

I was thinking last night as our distinguished president was addressing us so ably, that every teacher—in the rural schools particularly, and of course it would be well for every teacher in every elementary school—ought to have an intelligent understanding of the history of this particular kind of education and the meaning of these present-day educational movements. In fact, they need it really more than we do. To some extent it is an academic proposition with many of us, and, while we may be called upon to direct the movements to day, the teachers in these common schools are going to be the ones to determine how far these movements shall go right or wrong. Perhaps one of the ways in which the authorities might utilize the permission of the "Nelson amendment" would be to establish schools of education or departments of pedagogics in the land-grant institutions. Then the proper relation of agricultural education to other forms of education should be shown, so that the young people who are going out to do the teaching in the elementary and secondary schools will be pretty thoroughly informed historically and technically. They will not go out with an idea that they have got to teach agriculture or teach mechanic arts. They will go out qualified to teach the elements of science related to the great industries, and to teach more or less of the technique of these industries. But above all, I say they should be sympathetic; they should not be narrowly specialized, but they should have knowledge of the true relation of this kind of education to the other kinds of education so that these may occupy a proper place in the work of the schools which they enter.

We are not to prepare specialists; but, if we are to accomplish anything in giving reasonable direction and a rational basis to agricultural and industrial education in the common schools, we should take care that these should be related closely to the schools as they exist and to the method of education as it exists. Our efforts should be to better existing general education by relating to it properly our own peculiar and technical education.

The CHAIRMAN. I am sure that no more important subject has been before this convention than the one that has just been introduced by President White. The innovation, if it may be called such, in the Nelson amendment brings to us a wonderful opportunity, I think, in the great work of agricultural and industrial education. I think, for example, the opportunity for a larger and better and more important relationship with the United States Bureau of Education is one that has been the subject of very serious conferences on the part of this body of men. I think the somewhat delicate and important question which will arise in the several States in connection with the normal schools of the States is one which ought to be a matter of very serious conference and consideration. There is no doubt in my mind that the question will arise in almost all of the States where there are State normal schools, to what extent this is going to trench upon the functions of the State normal school. This will be not only a question as between the institutions, but it will be a question in the minds of the people, and to agree on a line of policy would be quite an important thing, I think, for us to consider.

The question as to whether or not this is to apply simply to rural and secondary schools or is to include the training of the teachers for colleges and the higher schools is still, I think, an open question. While it is true that we need a rural specialist for colleges, is it not also true at the same time that every one who gives instruction of any kind is greatly benefited by a certain degree of pedagogical training, pure and simple? Would it not be a matter of importance to us if the young men who are to teach in our colleges should, in addition to a high degree of special training, have some knowledge of the entire educational training? It has been remarked that it was a misfortune in the rise of this whole system of agricultural education that our educational philosophers, that our men in pedagogy—intelligent, resourceful men, men who are capable of great research—should have been so far separated from the practical men on the other side who had been establishing thus far our forces in America. If these two had worked in harmony and worked together, and some of the things that our pedagogical brethren could have given us had been given us, I am sure the progress would have been much greater than it has been.

K. L. Butterfield, of Massachusetts. The only contribution that I can make to this discussion is a brief description of the department of agricultural education at the Massachusetts Agricultural College. A department which is to be known by that title has just been established, and a professor of agricultural education has been elected.

For the germ idea of this department we take no credit. It was in reality forced upon the college. I may say also that the department is not dependent in any way upon the Nelson act, because the State has appropriated $5,000 for the purpose and will doubtless increase that amount if needed.

It seems that in Massachusetts, back in 1870, there was legislation which made it possible for localities to introduce industrial training into the schools or to provide special schools. In so far as there was general oversight at all, it was given to the board of education of the State, which is what we know in the West as the department of public instruction. The board, however, practically did nothing, and indeed, with the exception of the Technical High School in Springfield, comparatively little had been done by the schools of Massachusetts. Two years ago last winter Governor Douglas appointed a commission on industrial education, consisting of nine persons, with Carroll D. Wright as chairman. This commission took up the whole question, and I have here a copy of their report, of some two hundred pages, which, to my mind, is the most important document in industrial education which has been recently issued. The recommendations of the commission were very much to the point and very brief, and it might be well to read some of these recommendations, partly because they enact the charter of our own department of agricultural education and partly because they are a contribution to a discussion which has been going on during this meeting:

> There seem to be two lines in which industrial education may be developed—through the existing public school system and through independent industrial schools. In regard to the former, the commission recommends that cities and towns so modify the work in the elementary schools as to include for boys and girls instruction and practice in the elements of productive industry, including agriculture and the mechanic and domestic arts, and that this instruction be of such a character as to secure from it the highest cultural as well as the highest industrial value; and that the work in the high schools be modified so that the instruction in mathematics, the sciences, and drawing shall show the application and use of these subjects in industrial life, with especial reference to local industries, so that the students may see that these subjects are not designed primarily and solely for academic purposes, but that they may be utilized for the purposes of practical life. That is, algebra and geometry should be so taught in the public schools as to show their relations to construction; botany to horticulture and agriculture; chemistry to agriculture, manufactures and domestic sciences, and drawing to every form of industry.
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> The commission would also recommend that all towns and cities provide by new elective industrial courses in high schools instruction in the principles of agriculture and the domestic and mechanic arts, that in addition to day courses cities and towns provide evening courses for persons already employed in trades, and that provision be made for the instruction in part-time day classes of children between the ages of 14 and 18 years who may be employed during the remainder of the day, to the end that instruction in the principles and the practice of the arts may go on together.
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> The commission recognizes that there should be no interference with the public school system, as it exists by a separate authority having coordinate powers with those of the board of education; yet it believes that the elements of industrial training, agriculture, domestic and mechanical sciences should be taught in the public schools, and, as already stated, that there should be, in addition to this elementary teaching, distinctive industrial schools separated entirely from the public school system. The foregoing recommendations, together with the bill embodying the views of the commission as to separate industrial schools, solves this problem.

Instruction in public elementary and high schools would naturally and logically lead to the entrance of students on the work of the independent industrial schools.

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In order to secure proper instruction for teachers in the elements of agriculture, there seems to be a necessity for some normal department or separate normal school. The commission has considered two propositions—one to establish a normal school in the agricutural college and another to establish a separate normal school. The agricultural college has the plant and all the facilities for giving instruction in the elements of agriculture to those desiring to become instructors in such elements. It has therefore been considered the wiser plan to recommend a normal department in the existing agricultural college, thus saving expense and avoiding the necessity of duplicating plants. It is undoubtedly a fact that some of the seniors in the agricultural college are qualified to give instruction, thus utilizing the facilities of the college.

Then the commission recommended a brief law, which was enacted, and which called for the appointment of a permanent commission on industrial education. That law was carried out by the appointment, about a year ago, of a commission of five members. The commission has elected a secretary, and a few weeks ago presented its first annual report to the legislature. In brief, this commission is to have charge only of separate industrial schools. The former commission recommended very strongly that this whole matter of industrial training be brought into the public schools now existing, both in the elementary and in the high schools, but, as I understand it, the industrial commission has to do chiefly with separate industrial schools of mechanic arts or agriculture or domestic science.

The general plan is that the community, the town or the city, shall establish the separate school, and it is provided that any town or city giving a certain amount of money for such a school may receive from the State some aid—not over one-half in any case and less than that in some cases, depending upon the amount granted by the town or city. The commission, then, has full charge of these schools when once established—that is, in the matter of general arrangements.

The law also contains a section which reads:

The trustees of the Massachusetts Agricultural College are hereby authorized to establish a normal department for the purpose of giving instruction in the elements of agriculture to persons desiring to teach such elements in the public schools, as provided in sections three and four: *Provided*, That the cost of such department shall not exceed the sum of five thousand dollars in any one year, and that at least fifteen candidates present themselves for such instruction.

No financial provision was made a year ago, but one was made by the present legislature some months ago, and so the normal department of the college was established. It seemed to the trustees that the provision of the law was too narrow, and at one time they thought of securing an amendment to the law by which the department should be known as the department of agricultural education and this limitation of fifteen students taken off, but it was decided to act under this law for the present, at least. The department as organized is, as I have suggested, called a department of agricultural education, rather than a normal department, in the publications and in the plans for the department, though technically it is "the normal department." The man who occupies the chair is called the professor of agricultural education.

Perhaps I can suggest what we want this man to do—at least in the immediate future—by reading some notes from a memorandum which formed the basis of our search for a man.

General purpose. To institute research and to give instruction to students in all those matters which have to do (1) in general with all the various phases of agricultural education, (2) in particular with elementary agriculture suitable for teaching in primary and secondary schools and including such things as school gardens, etc., (3) with those aspects of the rural school problem which are of special interest to rural social betterment.

It is thus seen that the plan has been extended from the idea of a department which shall prepare teachers to teach elementary agriculture into a department which covers the whole field of agricultural education, although not neglecting this specific requirement of the law, which is, of course, germane to the entire plan.

"The teaching should include normal instruction at the college for those students who are preparing to teach in agricultural schools and colleges."

It is our belief that it is very important that men who are preparing for teaching agriculture either in the high schools or in the colleges shall have at least a fair amount of pedagogical training. I think everybody realizes in this day that it is one of the great weaknesses of our agricultural education that our men have too often been teaching subjects instead of teaching students. One reason for it, of course, is that the subjects have developed so rapidly; so it is not altogether the fault of the men. The time has come, however, when that weakness must be in some way done away with, and we hope to be able to say very soon that we will not recommend a graduate of our college for teaching in high school, college, or anywhere else unless he has had this work in agricultural pedagogy which we hope to install.

The teaching should include also normal instruction "for teachers desiring to prepare specifically for giving school-garden work and elementary agriculture in the primary and secondary schools. Such teachers may also be reached through teachers' associations, teachers' institutes, and summer schools."

Then the memorandum continues:

Such a department would call for the services of two persons from the start. The following is a tentative outline of the organization necessary:

(1) A professor of agricultural education. This man should deal with technical agricultural education, more particularly on its pedagogical side, but including also its sociological and administrative aspects. He would study the work of agricultural colleges, agricultural high schools, the feasibility of agricultural courses in high schools and academies, the teaching of agriculture in the lower grades of schools, and agricultural extension teaching.

He should teach in the college at least during one semester, offering electives to undergraduate and graduate students preparing for teaching in any form.

He should also devote a considerable proportion of his time to visiting the high schools of Massachusetts and attempting thus to get into close touch with high school principals and students.

He should make a study of high school work as it relates to the course of study at this college, and he should be prepared to assist schools of any grade in formulating agricultural teaching. He should work in the closest harmony with the Commission on Industrial Education. He should attempt to reach and help teachers of agriculture through teachers' associations, etc.

A second man will probably be an instructor in elementary agriculture. The work has been opened up by the organization of a summer school in agriculture which differs very little from the typical summer school of many of the land-grant colleges, a four weeks' course giving work in plant life, animal life, and so on, but of course an effort will be made, as far as possible, to reach the rural teachers and to emphasize the agricultural feature. It is called a summer school of agriculture and all through the work it is aimed to enforce the idea of agriculture.

In Massachusetts it is very clear, I think, that secondary education in agriculture will take both of its possible directions; that is to say, there will be established in the near future at least a few separate schools of agriculture, or separate industrial schools in which agriculture will be a part of the curriculum, possibly with mechanic arts. Many of the existing high schools will also introduce agriculture into the course of study. I fancy that the high schools in some of the larger towns and smaller cities will be the first to do that. There is already one agricultural high school in Massachusetts—a public school. We are awaiting also the opening of an agricultural school at Northampton, organized under a most remarkable will made something over sixty years ago by a man by the name of Smith, and the school is known as Smith's Agricultural School. It is only 8 miles from the college. The terms of the will also permit mechanic arts, but I understand the present board of trustees are anxious to establish an agricultural secondary school, if it is possible, and they hope to get State aid for that in some way.

We want to develop this agricultural education department as one which will represent the pedagogical phases of all forms of agricultural instruction. Our own course needs reorganization, and we want to reorganize it in the light of the best educational principles. We want to relate it more closely to the existing high schools, and particularly to the high schools which are to give agricultural instruction, and to the separate high schools of agriculture. We want also to make a study of the interrelations of our own subjects of study. So we hope that this department will in time come to be practically a normal school of agriculture, and that some rather close study will be made of the distinctively educational features of agriculture, not only with reference to elementary agriculture and secondary agriculture, but also with reference to the college courses, and even with reference, eventually, to extension teaching.

We have not as yet worked out any definite plan for cooperation with normal schools. There are seven normal schools in Massachusetts, several of them giving summer schools and all of them, I think, doing more or less work in nature study, school gardens, and that sort of thing. One of them, at Hyannis, is rather specializing in school garden work. The principal is probably as close a student of the pedagogical phases of school garden work and related lines as anyone in the country. We feel confident that in the near future there will be a specific arrangement between our normal schools and the agricultural college. It has been suggested by some of the normal school men that the principles of this cooperation should be something like this: The normal schools are supposed to study the pupil. That is their point of departure, and from that they work out what they like to call pedagogy. The agricultural college is supposed to emphasize the subject-matter—the technique. It has been suggested that those students of ours who wish to specialize in agricultural education, even though we give them more or less work in agricultural pedagogy, shall also take some work in the normal schools in order to understand the child, while normal school students who want to prepare specifically for teaching agriculture in the grades or in the high schools, shall come to us for the technique and atmosphere of real agriculture. I do not know just how this idea will work out. We expect, however, to cooperate with the normal schools.

This leads to a question referred to by President White which is, I believe, of much importance, and that is the relation everywhere between normal instruction and the work of the land-grant colleges. I suppose it is known generally by the members of this association that the normal school people in the Middle West are making a definite campaign to get assistance from Congress along this line. I do not know just how much strength that movement is gathering, but there are energetic men at work planning. It seems to me that it is worth our while to have this matter pretty carefully considered. As President White has suggested, this thing is looming large; it is important to have no misunderstanding, and it is more important to have the right thing done. Undoubtedly the land-grant colleges have their limitations with respect to the preparation of teachers in the elementary work, and I think that some working plan, which in general may be considered the plan for all of us to adopt, ought to be developed if it is possible.

The CHAIRMAN. Seventeen years ago, when the institution with which I am connected was founded, this phraseology occurred in the organic act:

"It shall be the duty of the college to train teachers of science and thereby further the application of the physical sciences to industrial pursuits."

That doctrine, I think, is embodied in the Nelson amendment.

Two years ago the college, which had been developing thus far without a department of education, established such a department. During the coming year there will be two teachers in that department. It has two functions; one is that of a propaganda in the elementary and secondary schools for industrial education, and the other is purely pedagogical. The persons who are in charge of this work are not trained in agriculture or in the mechanic arts or in domestic science, but are trained in pedagogical thinking, in the application of pedagogical principles to the business of teaching. A person who proposes to teach receives his or her training in domestic economy in the department of domestic economy and training in agriculture or mechanic arts in those respective departments, but if he wants to study the principles of teaching and the application of this work to the school business he receives his training, shorter or longer, from the department of education. I speak of this because it points out a little different phase of the subject from that suggested by President Butterfield. The difficulty we found in following the principle suggested by him was that there were many lines of industrial education besides agriculture, and it was impossible to find any one or two or three men who would be prepared to give instruction in the subject-matter itself, and also in the pedagogical phase of it.

C. B. WALDRON, of North Dakota. In North Dakota we have had a course something like that outlined by President Bryan in operation three years, viz, a three-year teachers' course The technical instruction is given by the members of the different departments. It has been my lot to give such instruction as I could along the line of horticulture and forestry, particularly the study of trees and nature generally. We have just completed our third year. We have met some difficulties which we did not foresee at first. The demand for teachers is so great and the price paid so high—no school is allowed to pay less than $45 a month for a teacher under the provisions of a State law—that we have very great difficulty in keeping the teachers for the full three years. We have a teacher of pedagogy who looks after their instruction in that line. We did not dare call it a normal school, and the normal schools looked a little askance at us, but we called their attention to the fact that the demand for agricultural teachers is so much greater than the supply can be for generations to come that there should be no jealousy along that line. Through the impulse of the Nelson Act we have engaged one or two more instructors and shall make this a more important course from now on, although we have carried it along successfully for a period of three years in the manner indicated, and I think it is worth the while.

A. C. TRUE, of Washington, D. C. I should like to call attention very briefly to what seems to me to be a rather fundamental consideration in this latter matter. A number of years ago I was a teacher in one of the normal schools in the State of Massachusetts. At that time the normal schools were giving special attention to questions of method, and they were not giving very much attention to questions of subject-matter. The result was that we turned out in those days teachers who had a good many ideas of a theoretical character as to what ought to be done in the schools and were comparatively poor in their equipment to teach the subjects themselves. As I understand it, the more recent development along those lines has been to pay very much more attention in the normal schools to subject-matter and make sure that the teachers know the subjects that they are to teach, as well as the best methods of teaching.

In this matter of agricultural education, it seems to me, we are in this position: Very little attention has thus far been given to the pedagogical questions, and the subject-matter that is accumulating so fast has not been gotten in good shape to be used in the schools. The problem, then, is to make studies along pedagogical lines and at the same time to get together the actual materials which are to be taught in the schools. That makes it very necessary that the pedagogical men who come into this work should work in the closest cooperation with the men who are actually engaged in teaching the subjects themselves. That has been one difficulty so far, as I understand it, in our agricultural colleges and universities where we have had departments of education and departments of agriculture. Each of these has gone its own way and has had no particular relations with the other. We must bring these two departments together and let them work in more serious cooperation. There will be plenty of work for both. I think this same principle applies to the work of the Office of Experiment Stations and the Bureau of Education in matters relating to agricultural education. We may all work along our respective lines, but in closest cooperation.

Robert Wallace, of Edinburgh University, Scotland. This is a subject that has been exercising us very seriously for a good many years in Edinburgh, but I can tell you of one phase of it which, to my mind, was most successful, but which was discontinued by the withdrawal of the Government grants. The Government has not been fortunate enough to find anything to take the place of the work which was done at that time. Fourteen years ago the Government began to give money grants and the University of Edinburgh got some three or four hundred pounds annually to train schoolmasters to teach agriculture. About 70 per cent of the rural schoolmasters selected were reared in the country, the sons of farmers and laborers, so that they had a considerable knowledge of country life. To this was grafted a knowledge of agriculture—it was my own idea. I gave them some sixty lectures during the time they were in session. They also got a smattering of agricultural chemistry and botany. The men came up for a month during their summer vacation and then went back and taught in the country schools. They secured the enthusiastic attention of the children, and the Government at that time gave grants amouning to £1 sterling per scholar to support the elementary classes in the country districts.

After classes of about sixty or seventy men had been held for two years those who had been most successful were selected and brought back for a senior course, largely biological and chemical. We had the best men from all parts of Scotland there and they rubbed up their knowledge of agriculture the second time, besides making the acquaintance of other successful teachers, and I think that great results were gained from that, but the Government conceived the mistaken idea to withdraw the £1 grant per pupil for teaching the subject. The grants to the university for the instruction of schoolmasters were also withdrawn, and, as I say, the whole thing has fallen through. The educational authorities are struggling to find something to fill the gap, as you are, but I can see you are on a hopeful line because you are going to employ men who know something about teaching and you are going to add to that the knowledge necessary to teach a specific subject.

J. K. Patterson, of Kentucky. I am somewhat reluctant to confess my ignorance before this body of learned gentlemen, but for years I have been endeavoring, quietly and patiently, by every means that I could, to ascertain what is meant by the expression "pedagogical methods;" what is meant by "agricultural pedagogy," or "pedagogical agriculture;" what is meant by "pedagogic phases," and all the multifarious ways in which the expression is used, but I have been unable to satisfy myself hitherto as to what is meant. I have attended so-called normal school conventions, and endeavored to ascertain from the leaders of thought there what they meant by these phrases that were repeated again and again, but the effort has failed. It is so hazy to me, so nebulous, so elusive, and so delusive that I am unable to grasp it.

Now, what does it mean? It must mean something, but it seems to me to be a juggling with phrases and words. I can understand very well if a young man or a young woman of fairly good ability should familiarize himself with the subject-matter, and has an enthusiastic desire to communicate the information which he possesses to others, he is going to find some satisfactory way of doing it. I can understand very well how, by studying the mental capacity of those whom you instruct, you will learn, pedagogy or no pedagogy, how best to reach the person to whom you wish to give information. I can understand very well how a teacher who is enthusiastic in his desire to communicate to his pupil a knowledge of Latin can go about it in such a way as to make a good Latin scholar of him in the end, if he will remain sufficiently long with the teacher. I can understand how a man who is an enthusiastic Greek scholar can find his way to make a good Greek scholar out of a person who is brought to him to learn Greek. I can understand how a good mathematician who knows his subject well can make a good scholar out of a man who has the native capacity for receiving mathematical instruction. But how it is possible to combine all this into the phrase "pedagogical method," or "normal school methods," or any other homologue you choose, is something that I can not understand.

That is what I would like to have some information about. You take a man who has been fairly instructed in the rudiments of botany, and he proceeds from the rudiments of botany on and on and on until he becomes a good theroetical botanist, and he becomes a good practical botanist by spending his time in the fields and in the woods, familiarizing himself with all the plants in his own immediate locality, and he enlarges his field of observation and visits localities adjacent to his own, and by and by he visits his county and his State. He is a good theoretical and practical botanist. What is the pedagogical element that you will add to him that will enable him to become a better instructor? What is added to him that will make him a better teacher than he would be without this superadded method? That is what I want to know. And if there be any gentleman here present who can give me a little information on the subject, I shall be amply compensated for the revelations I have made of my ignorance here.

THE SHORT PRACTICAL COURSE; ITS VALUE AND IMPORTANCE.

C. F. CURTISS, of Iowa. In taking up this subject I have proceeded in the usual way of making some inquiry about the status of the short-course work in other institutions, methods of giving instruction in that line, and the development that has taken place. I shall not take your time to present the result of the investigations in full, but merely call attention to some features of the work.

The short-course work has been established in some form in practically all of the land-grant colleges of America. Out of 39 colleges reporting all but 5, those of South Carolina, Illinois, Vermont, Virginia, and Arizona, are now offering short-course work. One of these, South Carolina, expresses a desire to take up short-course work; Vermont expects to reestablish the short course, and

Illinois and Arizona express the opinion that the short course is not needed. Illinois, however, maintains a ten-day convention, or an institute. The short courses range in length from two weeks to nine months. There appears to be a tendency to shorten the instruction periods and to extend the range of instruction. One State, Rhode Island, reports no interest in any subject except poultry. Arkansas offers work only in mechanical engineering. Iowa has reduced all short-course work to two-week periods. The total enrollment reported from 34 States for the past year is 7,776, making an average of 228 to each State. Seven States report enrollments of over 400 each. The opinions expressed concerning the value of the work are, with one exception, highly favorable, though the limitations of the work are generally recognized by the educators. The work is regarded as academic and of minor educational value. One State, Wisconsin, has tabulated statements from former students. Some of these statements are exceedingly interesting, and I think it well to read a few of them here. These are statements from former students who have taken the short-course work in Wisconsin. They read as follows:

I owe my success to the short course, and I doubt whether I would be on the farm to-day had I not taken that course.

The short course has increased my earning capacity 25 per cent.

I completed the short course in agriculture and found it intensely interesting and practical. Father says it was a paying investment in cultivating our first crop of corn.

We consider the time spent in Madison at the short course as two of the best-spent winters of our lives.

My earning capacity has been increased at least $20 per month as the result of taking the short course in agriculture.

Farm work is much more interesting to me since taking the short course in agriculture. Work that was once a drudgery is now a pleasure.

The short course in agriculture helped me in many ways. We have better live stock. We are using Silver King corn, which is better than our home corn, and this corn is well worth the cost of the short course.

I feel that the money spent in the short course is the most profitable investment I have ever made.

The short course gave me the general principles of agriculture, and covered the fundamentals of a good education with surprising thoroughness in so short a time.

We have added from 40 to 45 per cent to the production of our farm by practicing a thorough system of crop rotation. I have learned how to care for live stock, and we have increased our number 25 per cent and the quality of our animals 60 per cent. Our dairy herd produces easily 50 per cent more than it did before I took the short course.

Some of the institutions reporting emphasize the value of the short-course work to the institution as well as to the students enrolled.

In every case the institutions now offering short-course work expressed the intention of continuing the work, and in a number of States plans are being made to extend the work over a wider range of subjects.

One of the questions asked was as to the value of agricultural high school work and the probable effect on the demand for short-course work. Nine replies expressed the opinion that agricultural high schools would eventually in part or wholly obviate the necessity for short-course work; 6 expressed doubt about the effect of such schools, and 13 were emphatic in the view that these schools would not obviate the necessity for short-course work. Some stated that the short courses met the demands of a different class and that the agricultural high schools would stimulate this demand. In nearly every case faith was expressed in the utility of secondary agricultural instruction in some form. It is evident that the problem takes different forms in different localities. Some do not believe in a specialized agricultural or industrial high school. In Ohio agriculture is now being taught in over 50 township and village high schools, and such work is credited on admission to the State University. It is also stated that there are 40 or 50 small colleges in the State, many of which are considering the addition of agriculture to their curriculum.

In a general survey or summary of the field of short-course work some conclusions are inevitable:

(1) That short courses have proven to be an important factor in advancing the cause of agricultural education.

(2) That they have been of minor or doubtful educational value. Their function has been to impart information and arouse interest rather than to educate.

(3) Entirely apart from their educational value, or even a means of imparting information, the short courses have been fully justified in strengthening the institutions in clientage and public confidence. Perhaps their greatest service and utility will be found to exist in this functon. We are manifestly in the transition stage of short-course work.

It is apparent that there is a growing tendency to reduce the amount of the more extended short-course work and place greater emphasis on work of collegiate grade. The development of agricultural instruction in secondary schools will accentuate this tendency. These conditions must be regarded as gratifying from an educational point of view. Valuable and important as the short courses have been as factors in advancing the cause of agricultural education, I am confident that in the evolution of these institutions the short courses are destined to be still further abbreviated until they take the form of extension work, and will be properly classed as extension work, and the institutions will be left to develop resident work of the highest and most efficient collegiate grade.

J. Craig, of New York. I would like to ask Professor Curtiss if he has anything in his short course except thoroughly technical subjects. We found it necessary at Cornell to put in a little work in business and commercial law, commercial arithmetic, a little bookkeeping, and the like. There seemed to be a demand for such things, and we supplied that demand.

C. F. Curtiss. We have never given any work of that kind, and none of the institutions report any such work, if I remember correctly.

W. A. Henry, of Wisconsin. In Wisconsin we give farm bookkeeping and parliamentary practice as definite lines of instruction to all our short-course students. As most of you know, I am one of the apostles of the short-course movement. I wish to say after twenty years' experience, observing results during all that time, that I am more than ever a believer in this line of effort, as one worthy of attention by our agricultural colleges. That great factor, time, has now developed young men of earlier years in the short course until they are rapidly becoming the leading farmers of our State, the best stock raisers, the owners of the best herds and flocks, good, useful citizens all around. This year they are getting into the legislature and are showing up as some of the best lawmakers, and they made their way there because of their fitness and because their neighbors insisted on them as their representatives. I have watched this short-course effort carefully, and have seen the beneficial results flow out so freely that more and more I am in love with it.

We now have with us about 150 young men taking the four-year course in agriculture. We have over 300 taking the short course, and half as many more taking the dairy course. Putting aside all prejudice and looking at the matter from the outside, I am strongly impressed with the belief that a considerable number of our four-year students would be better off if they were in the short course in agriculture. Every fourth or fifth man in the short course has that quality of mind which would make him a worthy member of the long course. This is most unfortunate. What I say about students in the long course I believe applies to the colleges generally. As I see it, there are a good many young men now in our college classes that in later years will prove of no value to the State and unworthy of the institution nominally educating them. If these young men could only be given some useful trade, something practical, instead of so much language, science, and higher studies, it would be better for them. They have not the necessary ambition or ability to utilize the higher things that colleges offer, as they should. I have long been in the field of agricultural education, and time has broadened my views and clarified my understanding on some of these great elementary educational problems.

H. C. PRICE, of Ohio. I think Ohio has been one of the last to come into line on the short-course proposition, but this last winter we had a short course. We have had a two-year course for a long time, but were impressed with the necessity for a shorter course; we felt that there was a demand for it. After canvassing the situation thoroughly, we found that it rested between a two weeks' course—a very brief course—and a more extended course of some ten or twelve weeks, and that we were probably limited in our length of time by the holidays at the beginning and the opening of the spring work at the close, which, in our State is about March 15; so that there was a period of about ten weeks which we could count on for our winter course.

The farmers' institute system is quite highly developed in Ohio, the State holding as many institutes, I think, if not more, than any other State, ranging from two to four in every county in the State. We also have our farmers' week at the State capital, when the agricultural organizations meet there for a week. We finally decided on the ten weeks' plan, and we had an enrollment of nearly 140 with very little advertising.

I was thoroughly convinced that the class of men we could get in the ten weeks' course represents the cream of the State and the cream of the counties. They were the more progressive young men; they were men who had been reading the books and the bulletins and the agricultural papers and were men who are going to be the leaders in the State, and we were highly gratified with the success of the work. I remember an expression that President Thompson used after visiting the Iowa two weeks' course. He came back and said it impressed him that that course gave a great deal of inspiration, considerable information, and a little education. That is about the way, in fact, we felt about our work, and we told them, when they came, that the inspiration and the information and the education would be about in that order, and if it were only from the standpoint of inspiration I believe that a man would be fully repaid for the time and effort. I never have seen a more enthusiastic group of men than we had. It was but a short time before they organized themselves into a society and held weekly meetings. They closed with a banquet, arranged for an annual meeting at the State fair, and went home, each promising to send back another year three or four instead of themselves, or to come back themselves, perhaps. So that, although we have had but the one year's experience and do not know how to prophesy or plan for the future, the indications are that the course will be very satisfactory indeed.

Replying to a question as to the advisability of lengthening the two weeks' short course, Professor Curtiss said:

Our views on that point are that it would not be desirable to extend the course. I know that people in different localities approach this problem from different view points, and situations and conditions vary, but so far as we are concerned, we believe that about all that can be accomplished in the way of a short course in a period of any length can be accomplished in a period of two weeks. As stated in my report, the institutions that have the short courses are universally in favor of maintaining them in some form, and in making the suggestion and the prediction that the short-course work will eventually take the form of extension work and be classified as such, I did not mean that we are coming to that immediately. This movement in favor of secondary and industrial agricultural education has already gained a momentum that has given it place in our educational system, and when we get the system of secondary education established, as it is destined to be in the future, it is going to serve the same purpose, to a very large degree, that more extensive short courses are serving.

L. H. Bailey, of New York. For many years we have regarded the short-course work as extension work. We have had a State appropriation for some years for extension work. Theretofore we had a winter course maintained by the college of agriculture from its own funds. Six or seven years ago the winter-course work was transferred to the extension fund, and we have regarded it as true extension work from that time to this. It goes along with nature-study work, farmers' reading courses, and the like, and the programme is published in a separate catalogue.

Even if we do develop our high schools of agriculture, and have separate instruction in the subject in all our schools, I see no reason why we should not forever need some kind of short course in the agricultural colleges, but the character of students who will take the short courses in years to come will change somewhat. They will be persons who need to go further in some special line—those who wish to take up some particular line of animal husbandry, to make some particular kind of cheese, or who want some particular instruction in fruit gardening. I do not look for the secondary schools to take the place of the winter-course work, but I do look to these secondary schools to change the character of the winter-course work very decidedly.

C. F. Curtiss. Do you not think they will get this special work in a comparatively short period, and that it will be a shorter course?

L. H. Bailey. I think we will come eventually to different lengths of courses. I think we will meet the needs of different classes of men more than we have heretofore as time passes.

A. C. True, of Washington, D. C. It seems to me it would be a strange thing if, with the development of our research work and the accumulation of material, the time shall ever come when the intelligent farmer can not well afford to take from to two to six weeks in the winter out of his time at home and spend it at an agricultural college. So that even with the growth of the high school system I think we are apt to have a greater demand for the short courses. Then we must remember this also in discussions of this kind. At present we are dealing with very small numbers. Think how few men out of the total farm population we are actually reaching. With the growth of this high school movement, stirring up the mass of the population, it seems to me it is altogether probable that a great many more men will want to come to the college, at least for a brief time.

C. F. Curtiss. There is just one other form that the work has taken in our State that I failed to mention. That is, the work of the extension department proper, which can not be classified as short-course work. As a result of the two weeks' short course our extension department has been giving short-course work in various localities in the State. While it is true that a larger number of people will be interested in this work all the time, I believe it is also true that the mature men who are established in agriculture will find it impossible to devote the long periods of time necessary to take the more extended short courses. The tendency all the time will be to shorten the short-course work.

W. A. Henry, of Wisconsin. I wish to bring out more prominently the enormous and immeasurable value of the equipment at our agricultural colleges as an educational factor. When you undertake to teach agriculture out in the country or in the village you have an almost complete lack of the equipment and paraphernalia which so extensively and fully amplifies and expands your work at the college. Supposing a man wishes to learn about apple culture, the making of butter or cheese, the breeds of live stock, the use of machinery, or any other of the many things taught at the agricultural college. Compare what he can get from the equipment and facilities available there with those found in the village or city high school. I do not in the least wish to belittle these other efforts toward a useful end. The instruction they give is vastly better than none and should be encouraged, but with the splendid facilities and equipment assembled at our agricultural colleges my idea is that such equipment and facilities should be kept in use and running at high pressure constantly for the class for which it is designed. Our agricultural colleges and other educational institutions should be in operation both winter and summer; all the time, in fact. A microscope or a plow is useful only when it is being used. The dairy department of an agricultural college, or the chemical laboratory, is useful only when it is being employed in research or instruction. Why should these instruments or departments or anything connected with our colleges be idle for any part of the year if only we can bring the people to them for instruction and help. So I am with Director True and others when they say that this good work must keep going; that during those periods when our pupils are mostly away we should bring a great body of teachers to our colleges, where they can get the best of instruction in the shortest possible time.

H. C. Price. Do these short courses take the place of farmers' institutes or do they interfere with the farmers' institute system?

C. F. Curtiss. I think they have not interfered in any way. In fact I think they have tended to stimulate the farmers' institute work. They are more extended, systematic, and better equipped schools of instruction than the institutes. A very rigid and full programme is mapped out and held to strictly, differing essentially from an institute in this respect.

W. A. Henry. They give real instruction at all hours and on all subjects.

The section, at 3.30 o'clock p. m., adjourned sine die.

SECTION ON EXPERIMENT STATION WORK.

Afternoon Session, Tuesday, May 28, 1907.

The section was called to order at 2 o'clock p. m., M. A. Scovell, of Kentucky, in the chair.

The following paper was presented by F. C. Stewart, of New York:

Progress in the Control of Fungus and Bacterial Plant Diseases.

Perhaps some other title would have been more appropriate for this paper. It is not my purpose to trace the development of the science of plant pathology, nor yet to make an inventory of the achievements in that field; but rather to indicate the lines along which further progress on the control of plant diseases is to be made, and particularly to emphasize the importance of field work.

There may be some difference of opinion as to what constitutes progress in the control of plant diseases. It can not be denied that any addition to our knowledge of the cause of a plant disease, or of the physiology, habits, or life history of the casual organism, is a step toward the control of that disease. Such knowledge is fundamental, since it furnishes a basis for intelligent experimentation on treatment; but it is also plain that such knowledge is of no value to the practical farmer until it has been shown how it may be usefully applied to practical agriculture. The discovery of the cause of a disease is regarded by the scientist as definite progress, but to the farmer no progress has been made until a practical method of controlling the disease has been found.

From the farmer's point of view more progress has been made in the control of fungus diseases during the past twenty-five years than in all previous time, and practically all of our knowledge of bacterial plant diseases has been acquired during this period. The recent rapid progress in the control of fungus diseases is plainly due, in large part, to the accidental discovery of Bordeaux mixture in France in 1882. However, the application of this discovery to practice is to be credited chiefly to field experiments made by the United States Department of Agriculture and the American experiment stations. From 1886 to 1900 was a period of great activity, both here and abroad, in the study of fungicides and their application. The result was that spraying for certain fungus diseases became a common practice, and several destructive diseases were brought under more or less complete control.

But now we are told that spraying has reached its zenith and that the "shotgun" method of treating plant diseases is soon to be superseded by the use of disease-resistant varieties. The rediscovery of the Mendelian laws has brought about an unprecedented interest in experiments on the breeding of plants and animals, and plant pathologists have become enthused with the idea of breeding disease-resistant varieties. Undoubtedly some definite progress in the control of plant diseases may be expected along this line; in fact, some practical results have already been obtained. But I am confident that its importance has been greatly overestimated. Certainly, it is not profitable work for inexperienced investigators. Disease resistance may be secured, but the difficulty is to get in combination with it the other characters which a variety must have to be a commercial success. The work on disease resistance which is most likely to yield valuable results is the comparative study of existing varieties to determine the relative amount of disease resistance possessed by them. Accurate information of this kind is much needed.

Much remains yet to be learned about the causes of plant diseases, and the investigator who brings ability, patience, and enthusiasm into this work is almost sure to be rewarded. If successful, he will have the satisfaction of knowing that he has made a definite contribution to the advancement of botanical science and of agriculture as well, for it goes without saying that an accurate knowledge of the causes of plant diseases is of fundamental importance in the search for methods of control. Experiments on the control of a plant disease can not be made intelligently until the cause of the disease is known.

Another useful line of work and one which offers many opportunities to the investigator, is the tracing of life histories among the parasitic fungi. The life histories of many of the fungi which cause destructive diseases among plants are still imperfectly known. Investigations like those of de Bary on potato blight, Aderhold on apple scab, and Klebahn and Arthur on the rusts are the foundation stones upon which the science of plant pathology is built.

There is no lack of suitable problems. On the contrary, we are confronted with so many important and interesting subjects for investigation that we are bewildered and find difficulty in making a choice. Yet it seems to me that for those of us who are engaged in experiment station work there is a particular class of problems which should be given precedence. The ultimate aim of all station work on plant diseases is to find methods of controlling them. We should keep that constantly in mind. It is entirely proper to lay the necessary foundations by determining the cause of the disease and working out the habits and life history of the casual organism, but we should not stop there. It is incumbent upon us to finish the work by showing how the facts learned may be usefully applied in the control of the disease. And by this I do not mean merely theoretical considerations, but practical recommendations based upon the results of carefully conducted field experiments. In my opinion the most pressing need at the present time is for more and better field experiments on the control of plant diseases. We have gone on and on laying foundations and completing but few of them. The farmers have sometimes been patient, sometimes not, always hoping that sometime we might come to the point and make a practical application of our science; but as soon as one foundation is laid we leave it and take up another subject. It may be said that it is not the business of the plant pathologist to make practical tests of his theories; but if not his business, whose is it?

It is true that much valuable work of this kind has already been done, particularly in America, and it is steadily growing in favor; still it has not received the attention which its importance demands. It is also true that the literature of plant diseases is full of recommendations for the treatment of almost every disease of importance; but the trouble is that a considerable number of these recommendations have little or no practical value. Many of them have not even been tested experimentally, as, for example, the widely copied recommendation to burn diseased asparagus plants as a means of preventing asparagus rust, which is both impractical and ineffective. The gathering and burning of diseased leaves and refuse, so frequently recommended by European writers, may be good in theory, but is generally impractical because of the expense. Numerous other examples might be cited.

The plant pathologist's ignorance of the methods of practical agriculture is largely responsible for the impractical recommendations which have been made. Likewise, his disinclination to make field experiments is to be ascribed to the same cause. In order that field experiments may be well planned it is necessary that the experimenter have an intimate knowledge of the methods of culture usually employed on the crop under experimentation. Some of the best field experiments on the treatment of fruit diseases have been made by horticulturists, because their knowledge of fruit culture have enabled them to see how the discoveries of the botanist and mycologist might be applied to the best advantage.

Accordingly, the plant pathologist should study plant culture. He should mingle with practical farmers to learn their methods and get their point of view. He should attend farmers' institutes and agricultural and horticultural meetings, and above all spend a considerable portion of his time in the fields among the crops. We have been doing perhaps not too much laboratory work, but certainly too litle field work. By field work I mean not only treatment experiments, but the study of diseases in the field.

We need well-planned and carefully conducted field experiments in which all of our knowledge of botany and plant culture shall be brought to bear on the practical control of plant diseases. Various methods of treatment should be tested and compared under various conditions in order that we may be able to outline the best method of treatment for any given condition. In its final stage, this work should take the form of numerous large cooperative field experiments in which all the work is done under ordinary farm conditions, and a careful record kept of the expense and returns to determine whether the treatment is profitable. Managed as they should be, field experiments are expensive and consume a large amount of time, but they are highly profitable and enlist the support of farmers to a greater extent than does any other line of plant-disease work.

All of the important plant diseases are still good subjects for investigation. There is abundant opportunity for improving upon the methods of controlling them. Take, for example, the brown rot of stone fruits, *Sclerotinia fructigena*. Wherever the stone fruits are cultivated this disease causes enormous losses, yet no satisfactory method of controlling it is known. Several partially successful lines of treatment are recommended, but no one knows just what may be expected of them. Theoretically, the destruction of the "mummy" fruits is good practice. As to the use of fungicides, opinions vary. The use of Bordeaux before blooming and again just after the fruit is set is frequently recommended. Later applications of Bordeaux spot the fruit of plums and cherries and are liable to burn the foliage of peaches and Japan plums; hence copper acetate, ammoniacal solution of copper carbonate, and potassium sulphid have been suggested for the later applications. All of these have been tested to a limited extent. By some it is claimed that cherry rot may be controlled by frequent applications of a dilute solution of copper sulphate. Certain peach growers who have little trouble with rot attribute their success to their care in gathering and destroying the diseased fruits as fast as they appear. Some plum growers hold that the same method is applicable to plums. Others advocate thinning plums as a means of preventing rot. The gathering of plums before fully ripe has also been suggested. The lime-sulphur spray applied for San José scale may have some value as a preventive of rot; and, finally, certain varieties are more subject to rot than are others.

From the experiments and observations already made we certainly know something concerning the treatment of this destructive disease, but it must be admitted that, from the standpoint of the fruit grower, our knowledge is exceedingly imperfect. More accurate information is much needed and it is to be obtained only through field experiments. The lines of treatment above mentioned should be thoroughly tested, not on a few trees only, but on a commercial scale, and repeated during a series of years. Our knowledge of the control of several other important diseases is in a similar condition—further progress is dependent almost entirely upon adequate field experiments.

Even with the diseases for which we already have quite satisfactory methods of treatment, such as oat smut, peach leaf-curl, apple scab, and potato late blight, there is still opportunity for much valuable work in perfecting the details of the treatment; and it is to be accomplished chiefly through field experiments directed by men having a knowledge both of cultural methods and of technical plant pathology.

Because of the necessity of having a thorough knowledge of cultural methods it seems advisable that the plant pathologist should confine his attention to the diseases of a very limited number of host plants. By so doing time and energy are economized. If possible let the investigator devote himself to the diseases of two or three important crops. In fact, almost any single one of the important cultivated plants is sufficient. The diseases of the apple, the grape, the potato, the wheat, or the cotton would keep our ablest investigators profitably employed for a lifetime, and then much progress in the control of the diseases of these crops might be confidently expected. Under present conditions it may not be possible to so concentrate our efforts, but it is a goal for which we should strive.

Another thing to be considered in this connection is the intimate relation existing between the work of the plant pathologist and that of the economic entomologist. Broadly speaking, plant pathology includes economic entomology; but it has become customary for the entomologist to claim only those plant troubles definitely known to be due to insects, while all other disorders of plants, including those of unknown origin, are considered as belonging to the plant pathologist. In consequence of this arbitrary division it sometimes happens that, as our knowledge increases, certain plant troubles are transferred from the province of the plant pathologist to that of the entomologist.

Moreover, in the treatment of fungus and bacterial plant diseases it is frequently necessary to take into consideration the insect enemies of the plant. In many cases treatment for insects and fungus diseases may be advantageously combined. Again, insects may serve as distributors of fungus and bacterial diseases, and in such cases the control of the disease is largely dependent upon the destruction of the insects. Accordingly, the plant pathologist must have some knowledge of entomology or else have the assistance of an entomologist. Frequently the plant pathologist and entomologist find it mutually advantageous to work together.

This brings us to the subject of cooperative work. In the case of certain of the more complex problems in plant pathology further progress seems to wait on cooperative effort. If the plant pathologist attacks them single-handed with any hope of success he must have an intimate knowledge, not only of general botany, mycology, and physiology, but also of entomology, bacteriology, and practical agriculture. Sometimes it would be necessary to add chemistry to the list. It is out of the question for a man to be thoroughly qualified in all these different branches of science. The rational method of procedure in dealing with complex problems is for specialists in different lines to join their forces in cooperative work. Sometimes the botanist and bacteriologist should work together, or the botanist and entomologist, and frequently the horticulturist or agronomist should be taken into the combination. Through cooperative investigations it is frequently easy to solve problems which could be solved only with great difficulty, if at all, by individual effort. There are great possibilities in cooperative investigation. The chief difficulty encountered is the one met in other cooperative enterprises, viz, to maintain harmonious relations among the cooperators.

A. D. SELBY, of Ohio. Two things have impressed themselves upon me in recent years with respect to the problems of plant pathology, and especially in Ohio. I may say one of these—and perhaps two diseases will illustrate this—is the uncertainty of the recurrence in most destructive diseases within certain climatic zones. For illustration, the potato blight and rot is a very unusual disease in Ohio. Its occurrence will not cover more than probably a few years' period at a time, long separated by periods in which the disease is practically without economic importance. It seems to me that no other plant disease offers the difficulty of practical help to the grower that a disease of this nature offers. We have had, since I have been a student of plant parasites, but two series of outbreaks of this potato blight and rot in Ohio, the one in the early eighties, the other running through the last preceding three years, culminating in 1905 and diminishing in economic importance so greatly in 1906 as to make practical progress with the growers themselves, from their point of view, very difficult to attain. I would like to raise the question of how far it is possible by cooperative work as between investigators in different States to mark out with reasonable accuracy the limitations of these outbreaks.

The other example is for us equally coquettish; that is, the downy mildew of cucurbits. We may have a period of two years at a time in which its injuries in the State of Ohio will be nothing, and then there is a recurrence of the disease. I have worked the subject out recently for the Ohio Naturalist (February, 1907).

On the other side, I may say that the problems of soil-plant diseases seem to be increasingly difficult to control and of increasing economic importance. My own relations to this work have been focused, perhaps, in the last year or two, upon the study of the diseases in greenhouses and the diseases of field-plant beds, as in the case of tobacco.

Certain investigations, conducted chiefly by the assistant pathologist at the Ohio Station, emphasize the difficulty of dealing with diseases of the kind with which Professor Bolley became so intimately associated, namely, diseases transmitted through the seed. We have a great canning industry in Ohio, as they have in New York, and it has been stricken by a disease planted with the seed peas. The disease is planted by the seed growers. What shall be the avenue of practical escape? We did some work in Ohio in developing healthy seeds through the use of fungicides, to cut short the operations of this pod-spotting fungus, which is a seed-pea-investing fungus during its resting period. This is not without difficulty. A recent proposition has been made, emanating from a seedsman of Rockyford, Colo., that a variety of wax beans grown there at Rockyford, planted in the East, in comparison with seed beans grown usually in Michigan and New York, gives very much less of the parasitic pod spotting. How far would it be possible, with our particular troubles, like this of the bean and the pea, to produce the seed in an arid climate which would eliminate the practical difficulties in seed growing?

I wish to express my agreement with the writer as to the very great value of field experiments. At the same time the cases I have cited are chiefly such as are difficult to reach by any sort of experimentation alone.

The following paper was read by the secretary of the section, in the absence of the author, H. T. French, of Idaho:

DUPLICATION OF WORK BY THE EXPERIMENT STATIONS.

There has been much discussion, both public and private, upon this important subject, but there seems to have been no definite presentation of the matter in any gathering of station investigators.

It shall be my purpose only to open up the field for discussion, and from the opinions of those who are much more able to discuss this topic than myself we shall hope to gain some definite information which will be helpful to all who are vitally interested in the solution of station problems.

That much work has been duplicated in the past, and in the duplication much energy has been expended which might have been turned into new channels leading to the discovery of facts hitherto unknown to science, there is little doubt; but whether this energy was entirely lost or not has not been clearly demonstrated.

In section 2 of the Hatch Act, where the object of experiment stations is defined, the word "original" precedes the several clauses setting forth the lines of investigation which may be taken up under the act. At first thought this would seem conclusive that only new and unexplored fields were open for research and investigation; but associated with this word is the other term "verify," which means to prove or confirm the truth of any statement or fact. It is under this last term that an excuse for duplication of station work may be found. While two station men might find, at the end of a given line of original investigation, that they were duplicating each other's work, yet they might be entirely ignorant of the fact until the results were made public. Such a case would not, in my estimation, come under the head of duplication of work, for both might be equally original in their conception of the problem and in the methods of carrying on the work. This statement is not hypothetical, for we are all familiar with instances where parallel and identical lines of work were being pursued by two men unbeknown to each other. Some of the most important facts known to science have thus been obtained, and their infallibility is more thoroughly established by the coincidence of two or more men working independently coming to the same conclusions, if not at the same time, nearly so, and each being surprised that anyone else should have thought the same thoughts and dreamed the same dreams as he himself. It is a question in my mind whether it would not be a wise policy to have certain lines of research purposely duplicated, in order to save time in proving that the facts thus obtained are entitled to a classification under this head. Often the results are announced after long years of painstaking work, only to find that the conclusions are faulty owing to some mistake in the premises which might have been corrected at the outset had a larger number of individuals been engaged in the solution of the problem. Cooperation, it seems to me, could be used to advantage in scientific research as well as in business enterprises. The time may have arrived when individual effort should be supplemented by the effort of several other individuals working along the same line in order to obtain the greatest good. To be more specific, would it not be sound business sense to have three or four chemists undertake at the same time the same lines of investigation, duplicating the work, if you please, except in so far as it might be affected by local conditions, and the individual factor, which should be free to bring to bear any additional light that such conditions might afford? Instead of one man, who shall devote his entire time and talents to animal nutrition, have five men who shall work on the same problems, and then let the results be compared before they are given to the world. If this were done, there would be fewer revised text-books in which the statement is often made that, "in the light of recent investigations," etc., certain so-called facts published in previous editions would have to be modified so and so. Such statements are often found in station publications.

The desire to get into print some new discovery before it has been published by some contemporary investigator is very strong and sometimes gets the better of judgment. There is often serious objection to duplication of work in station investigations, due to the great expense necessary in carrying on the work; but we doubt if this is always a valid excuse when we consider the far-reaching effect for good or bad that such results may have.

That there should be a limit to the duplication of station investigations, especially as applied to the more intricate and delicate problems such as animal nutrition and dietaries, some plant-breeding work, and certain chemical investigations, there is no doubt. If work of this character could be so distributed as to cover large sections of the country of similar physical conditions, then much of this work which is being done by several stations at the same time would be obviated. Much of the duplication of work is due to the demand for investigations coming from men engaged in the practical affairs of the farm. The farmer is loath to accept results obtained in some remote section; he wants to know what the results would be right at home or within the borders of his own State at least; and there is considerable argument in his favor, for local conditions will often modify the results very materially. In considering this question we must not forget that the agricultural experiment stations are for the benefit of farmers in particular, and that the results obtained should have a bearing on their affairs, rather than to assist in the solution of intricate scientific problems which have no bearing whatever on science as applied to agriculture. This will of necessity cause a repetition of work done in other stations, from the fact that the work is not necessarily chosen by the station man himself, but is forced upon him by conditions prevailing in the community or State where the station is located.

Take "the comparative advantage of rotative cropping," which is one of the things specified in the Hatch Act. It is difficult to see how investigations under this head could be carried on without a certain amount of duplication of work. The fact that leguminous crops restore nitrogen to the soil has been demonstrated over and over again, and this fact, demonstrated by Lawes and Gilbert fifty years ago is just as applicable to any section of this country as it was to a particular locality in England; yet we can not use the fact in testing the value of crops in rotation without duplicating the work done by these men as well as that of hundreds of investigators in our own country. And since people are coming to visit station experimental plats to learn from actual observation, better than they are able to do by reading bulletins, there is abundant reason for having the real object lesson before them. If there were no other reason for duplicating station work than to furnish something tangible for the farmer to see, it would be a strong argument in its favor, provided such work was kept within due bounds. I do not believe in "thrashing over old straw," but there is much good to come from an actual demonstration of facts which may be well known to agricultural science. The science of agriculture is taught by "precept upon precept, fact upon fact, here a little and there a little," and in doing this it is not strange that many repetitions appear.

Experiments should not be duplicated simply to prove the fallacy of them in any particular locality when it is clearly known that such would be the case. For instance, it would be folly to duplicate experiments in growing Kafir corn in northern Idaho, for it is well known that the plant is not adapted to the climatic conditions prevailing there, and the fact can be so stated from what is already known regarding the habits of this forage plant.

Perhaps there is no line of work in which there has been a greater waste of energy than in testing varieties, and yet the law says we should test "the capacity of new plants or trees for acclimation." This does not say, however, that the experimenter should lay aside all reason in doing this work and test everything found within the covers of a given catalogue.

In our own State, Idaho, we find widely varying conditions, so that results attained in other localities may not apply in solving the same problems under changed conditions, and the author of the Hatch Act has very wisely provided for just such circumstances by stating that the work should be carried on, "having due regard to the varying conditions and needs of the respective States or Territories."

I think we should not lose sight of this last clause in section 2 of the act in our desire to acquire a reputation, which is often more appreciated abroad than at home, because of a failure in the application of the results we obtain to conditions existing within our own State.

With efficient State laws controlling the manufacture and sale of commercial fertilizers I see no reason why there should be a duplication of the analysis of these materials. It may be necessary to determine the character of the material offered for sale in order to see that it meets the legal requirements of the State, but this is a police duty which does not, in my judgment, belong to the station.

The Hatch Act provides for determining "the chemical composition of manures, natural or artificial," but it is supposed to be in connection "with experiments designed to test their comparative effects on crops of different kinds." In such work duplications of experiments made in other States may often occur, but it is not easy to avoid such repetitions if the provisions of the act touching this matter are carried out, and, on the other hand, the farmer is slow to accept results from the application of certain fertilizers in some other State or section remote from that in which he lives, however conclusive they are. He wants to know what can be done at home or under similar conditions, and he has a right to know.

In the West, where the States are so large and the conditions are so different from those prevailing in other States, and even remote sections of the same State, there is every reason why certain lines of work should be duplicated several times if need be, provided means are available to carry on the experiments. In the matter of combating insect pests and fungus diseases, local conditions will often vary results, so that the advice given from observations in one section will be entirely wrong in another, thus rendering the experimenter, and the cause of experimentation in general, odious in the eyes of the farmer.

I am a firm believer in object lessons wherever and whenever such lessons can be brought before a sufficiently large number of individuals to warrant the outlay of expense and energy to bring them about. Demonstrations are conducted at considerable cost of time and money as a rule; but there is no better way of impressing truth, especially on the minds of those who are not accustomed to applying things found in print.

There has been some just criticism of the use of station funds for demonstration work, some taking the ground that very little if any should be used for such purposes, others that a reasonable amount of such work was desirable, and still others that the demonstration work was the most valuable of any, and consequently the one which should receive the largest support. I am inclined to the middle ground, that some funds, and, in exceptional cases, considerable funds should be used for the purpose of bringing before the people whom the experiment was designed to benefit, a clear and conclusive demonstration of its practical application in producing results. And I wish to emphasize the last part of this clause referring to results. So many demonstrations are well planned and started under the most favorable conditions, promising all that could be expected; but, owing to lack of attention to details, or from the failure of certain mechanical appliances to work as intended, the final conclusion is never reached; consequently there are no results to show for the work. This is one reason why duplication of certain experiments has been criticised so severely by governing boards and the people in general whom the experiment was intended to assist. I believe much of the demonstration work should be conducted by farmers working in cooperation with the station. In our State we have a great many farmers growing corn, where corn has been grown very sparingly before, demonstrating that carefully selected seed, produced in the locality where it is intended to be grown, will produce good returns as a field crop. Such demonstrations by the farmers themselves, under direction of the station agronomist, has more weight often than the same work done at the station.

There has been considerable duplication of experiments in the feeding tests carried on by the stations. Many reports of corn versus wheat, or corn and wheat versus some other combination, have been published, and yet there are thousands of questions submitted to station authorities relating to these very subjects.

Our country is so large that an experiment in Kansas never reaches the farmers of Idaho, and some farmer wants a bulletin on the very topic covered by the experiment conducted in that State. The bulletin must be available in his own State, and based upon work done there if it carries any weight with him. This is only a single illustration which might apply to almost every kind of feeding experiments conducted by any of the stations in the country. Soil, climate, water supply, kind of animal fed, and a thousand other conditions enter into the experiment which modify the results, all must be taken under consideration, and the only way to do this is to perform the work under prevailing conditions regardless of what has been accomplished for the benefit of farmers in some other section. We must consider the needs of the farmer at home who is not familiar with the results obtained in some other section, and who often lacks the ability to discover the difference in surroundings and its effect on the work in hand.

Until we have some means of making all information gained common property, which shall reach the farmer's fireside in such a language as he can understand, there will be abundant reason for the duplication of many lines of experiment station work.

A paper on "Duplication of Work of the Experiment Stations by the United States Department of Agriculture," was presented by H. Garman, of Kentucky.

W. H. JORDAN, of New York. I wish to say a word with regard to the element of personal ambition in promoting efficient research work. As a station director I am a believer in fostering personal ambition and personal opportunity and have little sympathy with reducing our work to the mechanical basis of extensive cooperation where a man is but a cog in the wheel, nor do I believe in the extreme application of the altruistic idea that it makes no difference who does the work or how it is done provided it is accomplished. You can not withdraw the research worker from the domain of personal ambition and retain his maximum efficiency. He is deserving as an individual of any opportunity that a man has of attaining reputation. Have not you and I done a great deal because of that universal desire of men for leadership? While I believe in altruism and that the public good must be considered as the ultimate end to be attained, the research worker and also the institution should be safeguarded in the matter of pride of achievement. Any success which I have had in station work is, I am sure, due in part to the fact that I have tried to give the individual a chance.

Now, as to this matter of cooperation. The suggestion has been made that four or five men go to work on the same problem. I say let each man follow his inspirations, for there are individual points of view and individual ambitions that I believe should not be yoked up with those of other men. I believe in duplication of results on an independent basis, for what kind of standing would science have if there had not been duplication? We all know how many conclusions have been set right because several men worked independently at the same problem. Let us continue on the old lines that have made our science what it is.

H. L. Bolley, of North Dakota, said that nobody objects to certain kinds of duplication, because it is necessary; but that duplication without proper credit to other workers in the same field is not to be tolerated. He thought that this failure to give due credit, which is altogether too common in agricultural publications, was largely responsible for the low opinion of the scientific quality of experiment station investigations held by workers in other fields of science. He advocated some action by the association looking to proper regulation of the matter.

W. D. HOARD, of Wisconsin. I suppose it is in order to speak of some of the things that stand between you station workers and the final fruition of your hope, and the impression of your purpose upon that great body which is the foundation of your being and the foundation of the nation, that is, the men of the soil.

I have done lecture work, I think, in nearly every State in this Union on certain dairy topics, and in every State I have tried to study the sources of the weakness of experiment station work. I have been painfully impressed with the fact that in very many instances between the experiment station and the farmer has stood the demagogue; that the experiment station has been considered by the party in power an element of its power; that party politics have entered into the administration, the eyesight, the touch, the conscience, and the quest of the experiment station. I see no reason why any living force should come between you and the quest of the truth. Jefferson wrote over the University of Virginia "The truth shall make you free;" and it seems to me it should be the earnest purpose on the part of the experiment station to arrive at the truth, the whole truth, and nothing but the truth. Yet I have seen here and there and everywhere the idea that everything should be looked at through political spectacles. To the extent that that idea prevails do I. believe the ground is cut out from under your feet.

(After speaking in deprecation of the growing tendency to introduce academic customs and practices and toward what he considered the excessive use of very technical agricultural terms, which, in his judgment, had the effect of alienating the sympathy of the farmers, Mr. Hoard proceeded as follows:)

The final trial court in agricultural matters is the farm, where the men who study and the men who practice are measured. And over the judgment seat here, as in every other court, is written the inscription, "Study law," agricultural law, the laws and principles that govern, and, as fast as you can, deduce a system by which you can guide, not so much yourselves, but the farmer, so that he can begin to see the law, if possible.

I can not tell you how much I watch the growth of the experiment station work. I believe it to be the great plowshare that has been introduced into the crust of human indifference. You know you have to have hard material in the plowpoint. It sometimes has to strike hard and stubborn obstructions, and you have to break the stubborn glebe. You have to get into the popular conviction of the farmer the meaning of the work you are after. We have been enabled in Wisconsin to do a great deal, and I want to say to you, gentlemen, that the short course, the Wisconsin Dairymen's Association, and farmers' institutes have done more to recruit the State University than all the other departments in that institution of learning combined.

THE MORE URGENT PROBLEMS IN INSECT CONTROL.

M. V. SLINGERLAND, of New York. Economic entomology now ranks as one of the most important and valuable applications of a science to human needs. It touches almost every human interest. Previous to the establishment of the Federal agricultural experiment stations in 1888, several pioneer workers had scratched over the surface and had laid some life-history foundation stones of economic entomological knowledge. The insect problems of the farmer had grown so serious that when the experiment stations were organized about one-half of them arranged to thoroughly investigate these little foes. During the first decade the work grew until it demanded the services of nearly three times as many entomologists, and nearly every experiment station and agricultural college were studying insect problems. Now the work has grown to such proportions that the estimated value of farm and forest products annually destroyed by insects in the United States aggregates the vast sum of $1,000,000,000. And under the direction of more than two hundred trained entomologists at least $1,000,000 will be expended under legal authority this year in efforts to devise and apply ways and means to check and control insect devastations. Furthermore, as several more millions of dollars are also spent annually by agriculturists and others in fighting their insect foes, it is safe to assert that insect problems are among the most important that now confront our constituency, the American people.

The demands for elementary information and quick results explain why much of the entomological work of the experiment stations has been of a superficial, compilatory, and "hurry-up" nature. All this work was legitimate and much needed. and must be continued. Among the hundreds of entomological bulletins that have been published there are many which show careful and extended investigation and research. While there are now many of these oases in the vast desert of unexplored insect lore, much yet remains to be done. In spite of all that has been accomplished by the Federal and State authorities, including boards of agriculture, horticulture and entomology, experiment stations, and colleges, there are very few if any of the many insect problems that have been worked out to the entire satisfaction of most entomologists and agriculturists.

From both the scientific and the economic standpoint, no more effective work in solving insect problems has been done in any other country in the world. American economic entomologists have had to cover a vast field. Their duties in connection with the colleges and experiment stations have often included teaching students, lecturing to farmers, orchard and nursery inspection work, demonstration spraying tests or experiments, correspondence. and finally more or less time has been found to study the lives and habits of insects and devise and test remedial measures. All this work along educational and investigational lines is legitimate and necessary and must be continued. But the enactment of the Adams Act in 1906 has ushered in a very promising era for economic entomologists.

The money appropriated under the terms of the Adams Act is "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States, having due regard to the varying conditions and needs of the respective States and Territories." This act has brought about a very desirable readjustment of the work of the experiment stations, which will enable many scientific workers to devote themselves to original, investigational, or research problems, leaving the educational features of the work to others. Workers under this act will not be hampered by the popular demand for "quick returns." and thus much more scientific and more valuable results should be obtained. Such work will demand the best there is in the best trained entomologists. There will be opportunity and time to study exhaustively some of the general principles and fundamental problems relating to the lives and habits of insects and the methods employed by nature and man for controlling them.

All educational, demonstration, inspection, mere empirical tests, or duplication work, and publishing must be done with the Hatch or State funds, and only original researches or experiments can be conducted under the Adams Act. What shall constitute these original researches or experiments probably can never be determined by rigid rules. Much will depend upon the local conditions, previous investigations, and the capabilities of the entomologist to plan and carry out such work.

From authoritative sources I have gleaned the following statements regarding entomological research work under the Adams Act. Research work involves fundamental studies to be conducted along scientific lines for the discovery of wholly new truth and formation of principles quite independent of their application to the particular difficulties of the farmer. No matter how good, important, and valuable the work may be and however much it may be needed and demanded by the farmers and horticulturists, it must be original research. Research is not to be understood as referring to miscellaneous observations and notes on all sorts of insects, but to well-defined, scientific, and orderly investigations of individual insects or natural groups of insects. Propositions for entomological work under the Adams Act should be clear-cut, of limited scope and definite aim, and should be framed along scientific rather than practical agricultural and horticultural lines. For example, certain insects belonging to certain natural groups which may infest corn or clover may be studied entomologically, with special reference to the damage or benefit they do these crops, but general propositions to study corn or clover insects will not appeal as scientific research.

The work must have definite relation to agriculture, hence it must exclude the insects which have no economic relations; and some hold that those which affect the general interests of the rural home or community, as, for example, mosquitoes and household insects, should be excluded. One might contend, however, that inasmuch as the farm home is an integral part of the farm that it is just as much a part of the business of agriculture to protect the family from house flies and mosquitoes as to protect the cattle from the hornfly. And, furthermore, in certain parts of the country mosquitoes prevent successful dairying and cranberry culture. Work under the Adams Act should take into account the special conditions and needs of the respective States or Territories. This does not mean that old insect problems should be studied on the plea that one ought to go into every locality or State to determine with exactness the habits of insects and the methods of their repression. Such propositions of local studies as original research, especially on subjects like the codling moth and the plum curculio on which much work has been done, must be framed with unusual care and definiteness, so it will be clear that one is not following the beaten path of another. The mere testing of different remedies hardly constitutes research any more than the testing of varieties of plans. Well-defined, scientific, rather than empirical, studies of remedies, with special reference to determining how and why they kill and establishing treatment on a scientific basis, are legitimate under the Adams Act.

Entomologists should frame their propositions for work under the Adams Act with unusual care and with the understanding that one is making a proposition on which he is staking his professional standing as a specialist, competent to propose and perform original research. His desire to do the work, or the belief that the results of the work will satisfy or help the farmer, should not be taken into account. The only thing to be considered is whether it is original research along entomological lines. One may well take into account the judgment of his fellow specialists and what they are likely to think of the work when it is published. Thus the planning and execution of entomological work under this act will demand the best that is in entomologists. One's previous reputation will be at stake, and what wonderful opportunities such work will offer for an ambitious worker! Let us, as entomologists, realize the responsibilities demanded, as well as the opportunities offered, by the Adams Act, and put the best that is in us into the work.

What are the most important and urgent insect problems which now demand the attention of the American entomologists? To obtain information along this line I asked about one hundred of our economic entomologists a few questions. Replies came from a majority representing three-fourths of the different States and Canada. The more important insect problems may be considered in two groups; first, as national, and second, as local or State problems.

An insect attains national significance when a foreign pest invades our country and becomes a menace to general agriculture or to a great industry, like cotton growing, and results in legislative action by Congress. The investigation of such problems and the carrying out of any Congressional legislation regarding insect pests is naturally the work of the United States Department of Agriculture. Other national insect problems are mentioned later in this discussion. All investigations of old, long-established and widely distributed insect pests, like the San José scale, the codling moth, the plum curculio and the Hessian fly, and demonstration tests of methods for controlling insects, are, in the opinion of many entomologists, local or State problems to be worked out by the experiment stations or other local agencies. Let us consider some of the more urgent local insect problems.

All over the country there is much need of further educational and demonstration work in the field, and most entomologists feel that much work yet needs to be done on many of the old standard pests like the codling moth, the plum curculio, and the peach borer. Entomologists in twenty-five States report that there is need of further work on the life history and remedial treatments of the codling moth, while in ten States they report satisfaction with their present knowledge of this pest. Extensive investigations are now in progress on his insect in ten States. We need further information about the egg-laying habits, the number of broods, importance of the second brood, variations in its life history in southern localities and under extreme climatic conditions; and also more definite knowledge of the how and why of remedial treatments under the different conditions in which apples are grown in this country. Real original research can be done on this already much-studied codling moth in many parts of the country, in regard to both its life history and remedial measures. I think the same statement will also apply to the plum curculio, the peach borer, the apple maggot, the San José scale, root maggots, and a host of other and much-discussed pests.

In reply to one of my questions, 23 States and Canada say that the control of the San José scale is considered one of their most urgent insect problems; 15 States reported the same of the codling moth; 9 States reported the peach borer; 6 States reported the plum curculio, and 6 States included the woolly aphis among their more important insect problems. The apple maggot is very destructive in the northeastern States and needs thorough investigation. Many of the common pests which have been studied in the North need further investigation in the South and West, where their life histories differ and where the northern remedial recommendations are often not applicable.

There are a lot of big general insect problems needing solution. Many of these afford ideal subjects for original research and will require much time to work out thoroughly. Some of these problems will necessitate the cooperation of chemists, physiologists, horticulturists, meteorologists, spray-pump manufacturers, soil experts, and others. Insecticides need to be studied from the chemical and physiological standpoint so we may have more definite information in regard to how they act on both insects and the plants they attack. This may enable us to devise more efficient preparations. We ought also to have some general standard of comparison for insecticides. Is there any possibility of plants absorbing poisons in sufficient quantity to be destructive to insects is a question that is well worth considering in this connection.

There is a vast, little explored, and important field for the entomologists in the study of the insect pests of forest and shade trees and ornamental plants. The insect enemies of live stock is another important and fertile field for research work. Grass and pasture lands and most cultivated field crops suffer severely from insect pests about which we have much to learn. This is especially true of those living underground, like wireworms and white grubs. Vegetable gardening is an important industry in many parts of the country, and insect ravages are extensive. Much remains to be learned about the lives and habits and remedial treatments for such vegetable pests as root maggots, flea beetles, and many others. Greenhouse crops also suffer seriously from insects, and we have little definite information about the temperature and moisture conditions essential to successful fumigation or other treatments for such pests.

There are certain groups of insects which need thorough investigation. Among the plant lice are to be found many of our most destructive pests, and they afford many opportunities for entomologists to exercise their best thought in tracing out their complicated life histories and in devising special methods for treating them. We need further and more reliable contact insecticides for sucking insects. Some one should also study the details of the feeding habits of these insects and determine if possible what they do to cause the striking changes in plant tissues that often occur where they work. Our knowledge of the insect pests which work underground is very meager as regards both life histories and special remedial measures. Such natural groups of insects working underground as the white grubs or May beetles, the wireworms, the root maggots, and some of the plant lice are striking examples of the need of thorough investigations and research in economic entomology.

The Adams Act provides a way for more abstract research in the general and fundamental principles covering the ecology of insect pests and their control. Valuable results should come from an exhaustive study of the factors—climatic, organic, etc.—which influence the health, or what I have called the "ups and downs" or periods of great destructiveness and comparative scarcity of insect pests. Some entomologists hope to see the time when they can predict or state the probabilities of excessive depredations by certain insects with as much success as the weather forecasters sometimes predict. Owing largely to the effective work of their parasitic enemies we can already predict with considerable certainty that the most destructive periods of the Hessian fly and army worm will not continue for more than a year or two in the same locality.

The great problems of the cotton boll weevil, the gypsy moth, and the browntail moth are too big for a locality or State to handle satisfactorily and successfully, and they therefore rank as national problems to be investigated and treated under the supervision largely of the United States Department of Agriculture. The whole cotton belt is trembling under the advance of the destructive boll weevil, and the whole nation, even to the shores of California, is watching with deep interest the fight to check and control the gypsy and brown tail moths in New England.

Other important insect problems of a national character are being much discussed. For example, the introduction from other countries under scientific supervision of parasites and other enemies of injurious insects may help materially in insect warfare. Here is a legitimate and profitable field for work, which can best be done by the United States Department of Agriculture. Many also think that a national quarantine law operating along our whole coast and the Mexican border line would help much to keep out the insect pests of foreign countries. California has maintained such a quarantine law for many years and apparently with good results. While it is very doubtful if such insects as the boll weevil, the elm-leaf beetle, the horn fly, and other serious pests could have been kept out by such a quarantine, yet a protective measure of this kind would doubtless result in much good, especially to horticulturists.

Another national problem which has been agitated by horticulturists and entomologists for several years is the question of uniform laws for nursery inspection and certification of nursery stock as regards the San José scale and other injurious insects. While this is conceded to be a very important interstate insect problem, some object to a governmental supervision of local problems affecting nurseries and orchards.

While I have by no means exhausted the list of more urgent and important insect problems in the United States, enough have been mentioned to show that there is a vast field for needed research and investigation by the economic entomologists. As the loss from insect ravages is doubtless nearly as great as that from adverse climatic conditions, the control of insects is one of the greatest problems in agriculture to-day.

E. D. SANDERSON, of New Hampshire. Professor Slingerland and others have raised certain points, which, from the standpoint of the station, it seems to me, it might be well to consider. Take, for example, this problem of the codling moth. I have studied the whole literature of that insect, and have found a great deal of it absolutely uninterpretable. The results are not recorded in a way in which anybody can find out just exactly what the men did. The experiments were in many cases apparently planned for temporary results. I am not criticising the men, but is it not possible at the present time to have some plan of arranging these experiments so that we can get the best results? Is it not true in business to-day that the tendency is toward centralization—getting together, as in big corporations? On the other hand, does it minimize the opportunity to get up in the world? Are not men needed in the big trusts just as much as they ever were? Do they not get great economy by getting together?

Now, I have a practical example of this. One man in the Bureau of Entomology was working on this codling-moth problem. He had opportunity to work in several States on the problem, whereas I was working in one State. He and I got together and united our methods, and through that we are making some attempts to get at the method of attacking the codling moth. It seems to him and to me that such a thing is feasible.

I believe that much more might be done if the directors of the various stations would insist that the men have their plans of investigation well outlined, and, where possible, consult with other stations upon them.

E. D. BALL, of Utah. I agree with Mr. Slingerland as to the importance of sticking to an old pest after you have gotten in position to do good work on it. I have found vacillation in this regard not so much the fault of the entomologist as of the station directors. A director said to me after I had worked on the codling moth for seven years, "You ought to be done with that now." I thought I was just getting where I could do good work. There is one other point that I would like to mention in this connection. There is a great field for the National Government in the work we are attempting to do, as well as for the experiment stations, and there need not be any great amount of friction or duplication.

We of the West have possibly an entirely different point of view from those of you from the East. New York, for example, probably has money enough to carry on all the investigations that are needed there in entomological lines, but the Western States are an unworked territory with thousands and millions of productive but undeveloped acres. We do not care who does the work, whether the Government or the station. We have not the money to work out methods of handling that land, of producing greater crops. We are glad to cooperate—not to duplicate the Government's work—in working out the problems of our great undeveloped West. If we had to depend upon the small amount of money that we get by the taxation of the land that is now under cultivation, the West would be centuries developing, whereas it can, with the aid of eastern capital, be quickly brought to its full fruition. If we said to the East that we did not want its capital, that we could get along very well with our own, what would happen to the West? It would never be developed. We must have your money to develop our railroads and our great projects, and we need the money of the United States Government to help us in our investigations, and while we do not want friction, we do want cooperation.

R. H. FORBES, of Arizona. I can not omit presenting a view diametrically opposite to that expressed a while ago as to motives that actuate station workers. I think if there is any one sentence that expresses our own attitude toward our work and toward the public, it is this, that it is not science for science's sake alone; it is certainly not science for personal reputation's sake; but it is science for humanity's sake, that we are engaged in pursuing down in Arizona. To be sure, we are a group of humble and inconspicuous men, and we are down in the soil with the men, trying to make a farm out of an alkali spot; but I think they are appreciating it; at least the legislature at the last session suspended the rules and passed our appropriation bill under that suspension. It may be that in some way men, connecting actions with motives, may appreciate the motives that I hope are animating one and all of our little group of workers in the far Southwest. I protest against an appeal to human selfishness in a group of men who ought to stand on higher ground.

ELECTON OF OFFICERS OF THE SECTION AND MEMBERS OF THE EXECUTIVE COMMITTEE.

The committee on nominations, consisting of A. D. Selby, of Ohio; C. D. Woods, of Maine; and W. H. Jordan, of New York, reported as follows: For chairman, C. E. Thorne, of Ohio; secretary, P. H. Rolfs, of Florida; members of the executive committee representing sections: W. H. Jordan, of New York, and C. F. Curtiss, of Iowa. The committee also recommended that the special subject for discussion at the next convention be Milk production, including sanitation, and the general subject, Relation of the experiment station to work in instruction, with special reference to its popular phase.

The report was accepted.

Thereupon, at 4 o'clock p. m., the section adjourned until Wednesday afternoon, at 2 o'clock.

AFTERNOON SESSION, WEDNESDAY, MAY 29, 1907.

The meeting was called to order by the chairman.

The following paper was presented by G. E. Stone, of Massachusetts:

THE RELATION OF CULTURAL CONDITIONS TO PLANT DISEASES.

The permanent existence of any species depends upon its capacity for adapting itself to its surroundings. Cultural conditions are intimately associated with a plant's environment, since they are concerned not only with tillage and the application of plant foods, but also with such factors as heat, light, moisture, etc. An understanding of the optimum cultural conditions necessary for the growth of any plant is of the greatest importance in crop production and the study of pathology. The close student of physiology and pathology must always have in mind the perfect type of plant; that is, one possessing perfect health, otherwise his diagnosis will be of little value. In the same way that a physician can diagnose a patient's condition by an examination of certain organs or gain an idea of the state of his general health by considering the various symptoms, one familiar with the normal functions of a plant can ascertain its condition by certain features which it may display.

It is regrettable that the laws of health and the symptoms characteristic of diseases in plants should not be more thoroughly understood, especially by those who are studying plant nutrition. The practice of drawing deductions from sickly or abnormal plants is not based upon scientific methods, although it is commonly done in certain lines of agricultural experimentation.

The highest conception of health and vigor in plants is brought to a realization through the remarkable skill of expert gardeners, and it is no exaggeration to say that this class of men possesses the most profound knowledge of the plant's requirements and limitations. Those trained men who have made a specialty of greenhouse crops for years are unexcelled in their skill and knowledge of a plant's needs, and this is also true of many intensive agriculturalists. Some of these specialists have gained a remarkable insight into the nature of plant reactions, the slightest change which takes place in the plant organism being noticeable to them; but such a large percentage of this knowledge is intuitive or instinctive, as it were, that it can not be conveyed to others. The best gardeners are in sympathy with all that pertains to the well-being of their plants, and they are continually observing each minute detail, thus gaining a knowledge of the influence of various external factors which in any way affect the organism. A slight modification in the light intensity or in the temperature for even a brief period is sufficient to cause variations in the plant development which are discernible to the expert gardener. The cultural conditions which both directly and indirectly affect a plant in respect to susceptibility to disease are various. A plant is affected by light, heat, electricity, gravity, soil (both its chemical and its physical constituents), moisture, air, biological and symbiotical relationships, etc.; and in greenhouses by such factors as ventilation, air space, quality of glass, and in fact the simplest features concerned with greenhouse construction. It is in a greenhouse that we gain the most insight into the relationship existing between the conditions surrounding plants and their susceptibilty to disease, for here the gardener has the environment largely under his control and can therefore regulate the conditions to meet the requirements of his plants. The relation of cultural conditions, using this term in its broadest sense, to plant diseases can be most satisfactorily studied in a greenhouse, because here it is possible to modify and eliminate certain factors which have a direct bearing upon the diseases and in this way we are able to determine their true significance. When the conditions surrounding the plant are far from the optimum, injury or even death may follow. A stimulus which may prove beneficial under certain conditions may injure or cause the death of the organism in others, and it is only by meeting the normal requirements of the plant and by possessing a knowledge of the optimum conditions that we can expect to obtain the perfect organism. Every factor which has a bearing on the development of the plant must be carefully considered if we wish to realize a perfect type. These factors not only affect development, but have a fundamental bearing upon immunity to disease, and if we can control the environment we can control the disease to a large extent. Even when it is not possible to modify the heat, light, and moisture, as is the case out of doors, we can largely eliminate infection by making use of certain cultural practices; in fact, cultivation and feeding constitute important factors in the control of disease.

Light affords a good illustration of the rôle a single factor may play in maintaining healthy plants or favoring disease in others. The physiological effect of light is to inhibit growth and to induce the formation of a firm texture of the tissue. On the other hand, lack of light stimulates growth, but plants grown in darkness are etiolated and lack firmness of tissue. There are many instances of the absence of light being responsible for serious troubles, and in others excessive light undoubtedly exerts a detrimental influence. The tonic influence of the Bordeaux mixture in favoring the formation of chlorophyll and carbon assimilation in many plants would appear to be due to the screening or lessening of the light intensity. Sun scald, which occurs on various trees, is brought about by excessive light, as is the case with apple trees, which, when defoliated by the gypsy moth, usually die from the effects of sun scald; and there are apparently some cases, at least in greenhouses, of too intense light or the conditions resulting from it causing trouble to crops. In the northern latitudes many greenhouse crops do not obtain sufficient light during the winter months, and when cloudiness prevails it is with some difficulty that crops are matured without becoming diseased. Lack of light is responsible for mildew in greenhouses and the leaf spots common to various plants result from shading. These spots are seldom if ever found on plants to which sunlight has access. The sclerotinia diseases of lettuce, watercress, and parsley are likewise induced by crowding and shading, and light in such cases will prevent infection. It is well known that the absence of light causes the so-called "layering" of wheat and favors "damping off" of cuttings, and the presence of mildews on various plants grown in the shade are too well-known to need consideration. The improper regulation of atmospheric moisture and ventilation are responsible for many fungus diseases and the control of these factors is important in preventing these troubles. Among the mildews, Cladosporium can be entirely controlled by holding the moisture in the greenhouse in check and by paying strict attention to ventilation and light. Many gardeners have succeeded in controlling the chrysanthemum rust by using proper precautions in regard to moisture alone.

A series of the most troublesome diseases common to cucumbers and melons out of doors—downy mildew, Alternaria, and anthracnose—can be absolutely controlled in the greenhouse if attention is given to moisture, light, and ventilation. The presence of light and the circulation of air have a marked effect upon the development of resistant tissues in greenhouse crops, and the control of moisture is necessary to prevent the germination of various spores which are likely to infect crops. Too great a degree of heat and moisture in the soil gives rise to serious troubles, as may be seen in the case of œdema; and when seedlings are grown in soil that is kept too moist and too high in temperature they are likely to "damp off." The presence of water in a plant in excess of certain amounts is favorable to disease, as is shown in the carnation's susceptibility to rust; for example, those carnation plants possessing the greatest amount of water in their tissues appear to be the most susceptible to rust. Tillage, manuring, irrigation, mulching, etc., are important factors in regulating soil moisture and in securing vigorous plants, and go a long way toward rendering them immune to certain diseases.

An excessive amount of moisture in the soil stimulates growth and often renders plants more susceptible to fungus diseases, as stimulation of various sorts may result in weakening a plant and rendering it less immune to disease. Some crops, on the other hand, are probably rendered more susceptible to fungus diseases by feeding and cultivation. The limitations of forcing have undoubtedly been overstepped in some cases, and this is especially true of the carnation, which has been much troubled with the wet and dry stem rots since the modern methods of forcing have come into vogue.

In the consideration of certain pathological problems it is essential that one should make proper allowances for differences of environment due to climatic influences, since the conditions may be such that a disease constantly causes much loss in one locality and scarcely any in another, and while it may be necessary to spray for a trouble in one State, in others no attention need be given it. There is no doubt that in some instances it would be wiser to devote one's energies to cultivation as a means of preventing plant diseases than to resort to the use of fungicides. Our most skilled agriculturists, such as our florists and market gardeners, seldom if ever resort to spraying, and in greenhouse culture the use of fungicides is practically unknown. Certain crops are greatly benefited by being sprayed with fungicides; but on the other hand there are crops which have been sprayed for many years with little or no benefit as far as the control of pathogenic fungi is concerned, and the money expended in spraying would in such instances be more judiciously spent on feeding and cultivation. Some of our best landscape gardeners have advocated that if $25 is to be used in planting a tree, about $23.50 of it should be used for preparation, and such advice is based upon the best agricultural methods. If intensive agricultural practices were applied more often to the growing of plants, pathologists would have much less diagnozing of diseases to do.

There are enough pathological problems awaiting solution, however, for we know little about the causes underlying immunity, whether in plants or in animals, and we need to give more attention to their study. That vital depressions are the cause of disease in many instances, if not in all, is undoubtedly true, but why certain pathogenic organisms should attack a plant the moment its normal functions are deranged is still a mystery.

Every influence which may in any way affect plants should be carefully studied. We should understand what influence the chemical and physical properties of the soil, manures, fertilizers, air, drainage, etc., have upon susceptibility to disease. The plant organism is an extremely complex mechanism, very plastic and responsive, and is continually being acted upon by a number of forces or stimuli, which in turn produce a series of self-regulatory and correlative reactions. Undoubtedly in the future the control of plant diseases will depend more upon breeding and maintaining the best cultural conditions than it does now; but for the present spraying must be employed when practicable until something better shall have been discovered.

Thereupon, at 3 o'clock p. m., the section adjourned sine die.

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